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CONTRACTING ORGANIZATION: California State University Dominguez Hills Foundation
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| 14. ABSTRACT Major Accomplishments for Year 1: recruited Kate Muller, CPO, as Lead Orthotics Instructor; writing of new Orthotics curricula and syllabi; installation of new Orthotics Laboratory and equipment; purchase of expendable supplies for laboratories; expansion of existing Prosthetics Laboratory; build out of "smart" classroom and Prosthetics Gait room; recruitment for 25 Spring term Orthotic and Prosthetic students; recruitment of 16 Fall term Prosthetic students; trained 41 total graduates during Year 1 of expanded program. Achieved full NCOPE and CAAHEP Accreditation through 2009 for new Orthotics Program. Major Outcome Tools started in Year 1: creation of new midterm and final exams in each course; development/revision of checkout criteria for all Orthotic and Prosthetic patient fittings; development of Practical (summative) Exams for each clinical course; developed Town Hall (group focus) Meetings for respective classes to provide criticism of ongoing teaching and learning; development of Patient Survey for patient models to assess professional behavior of assigned students; development of end of semester Student Survey to provide feedback on quality of teaching content. | | | | | |
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Program Evaluation of Outcomes Based Orthotic and Prosthetic Education

Award Number: W81XWH-06-1-0144

INTRODUCTION:

There are not enough qualified Prosthetic and Orthotic practitioners to provide services needed by thousands of military amputees, U.S. Veterans, and other Americans living with disabilities. With Department of Defense funding (2005-2008) the university has started a new Orthotic (orthopedic bracing) program, and increased enrollment in its Prosthetic program. The goal is to enlarge training capacity from 28 students to 48 students per year. Historically, Prosthetic and Orthotic training programs have conducted small classes with intensive hands-on laboratories that have been very vocational in nature. Therefore, as this program expansion and evaluation takes place, the program will also focus on moving from vocational and knowledge based accreditation standards to competence based standards that are focused on outcomes assessment.

During this expansion, a Program Evaluation will be conducted, asking the question “What are the effects of additional resources and increased training capacity on an Orthotic and Prosthetic training program and its clients? A Program Evaluation will assess the effects of increasing practitioner training capacity by 71% on program inputs, activities, outputs, and outcomes. The evaluation will examine impacts/benefits/changes to students and orthopedic clients as a result of program growth and curriculum changes during and/or after their participation in this 3 year study. Outcomes evaluation will examine these changes in the short-term, intermediate term and long-term. As this expansion occurs, the program will move from knowledge based accreditation standards to competence based standards that are focused on outcomes assessment.

BODY:

Program Evaluation of an Outcomes-Based Orthotic and Prosthetic Education Program

The highlights of first year project activities have focused on program growth and expansion. Kate Muller, CPO, was recruited to become the Lead Orthotic Instructor. A new, 1000 square foot teaching laboratory and 900 square foot “smart” classroom were developed in existing space. A remodel of the Prosthetics Gait room, two additional offices, and installation of a wheelchair lift and addition of a cafeteria privacy curtain were also completed.

Project start up activities have included recruiting new faculty, including Kate Muller, CPO, and Glenn Ham-Rosebrock, CO. Kate Muller is the Lead Orthotic Instructor, and has written new Orthotics curricula, including Upper Extremity Orthotics, Spinal Orthotics, Lower Extremity Orthotics, and Research syllabi. TBC Contractors, under the direction of Ossur and California State University, have completed a remodel consisting of a new, larger classroom, a 912 sq. ft. teaching laboratory, and installation of all benches, hand tools, and AV equipment. Scott Hornbeak and Marvin Ramirez designed and installed the custom benches and equipment in the new orthotics laboratory. An existing prosthetics laboratory was enlarged to accommodate a new gait training area.

New students were recruited to start instruction in the Prosthetics and the new Orthotics Program. The program recruited 9 new students to enter the inaugural orthotics certificate program, which started on January 30, 2006. Expendable supplies and materials were purchased to support the laboratory requirements.

An additional 4 students were recruited to enter the Prosthetics Certificate course that also started in January 2006. A total of 25 Orthotic and Prosthetic students graduated from the new Orthotic Program and the expanded Prosthetic Program by August 1, 2006. 16 additional students were recruited and have been attending the Fall 2006 Prosthetic Certificate courses. We with their graduation in December 2006, we anticipate creating 41 total graduates during the first year of the expanded program.

January – August 2006 was highlighted by teaching activities in the both the Orthotics (9 students) and Prosthetics (16 students) Certificate programs. Further purchases of capital equipment and expendable supplies were also made in support of the program expansion. A large expenditure (\$79,250) was processed for payment of the remodel and build out of the Orthotics Lab, Prosthetics Gait room, Cafeteria privacy curtain, upstairs classroom and offices, and installation of the wheelchair lift.

August – November 2006 was highlighted by teaching activities in the second Prosthetics (16 students) Certificate of the year. Additional expendable supplies and some minor capital equipment were purchased. A recruiting effort also was undertaken to recruit and admit new Orthotics (15 students) and new Prosthetics (16 students) Certificate students who will begin their respective program in January 2007.

Orthotics Certificate Progress: In January 2006, we moved into the new Orthotics Laboratory, consisting of 17 training stations, new tools, power machinery, and a new LCD projection system. Under the leadership of Kate Muller, CPO, and Glenn Ham-Rosebrock, CO, students began formal instruction in Orthotics. Kate Muller is the Lead Orthotic Instructor, and has written new Orthotics curricula, including Upper Extremity Orthotics, Spinal Orthotics, Lower Limb Orthotics, Pathophysiology for O&P, and Research syllabi. A cafeteria area was modified for use by Ossur and CSUDH, and our program has purchased and installed privacy curtain for larger patient evaluation and critique sessions in this large downstairs space. Finally, an additional instructor, Mark Muller, CPO was hired for 2 days per week to meet the increased workload.

The following courses were successfully completed in the Orthotic Certificate program, ending August 1, 2006:

| | |
|---------|--|
| HEA 345 | Biomechanics for Orthotics and Prosthetics |
| HEA 355 | Material Science and Applied Anatomy for O&P |
| HEA 335 | Practice Management for O&P |
| HEA 440 | Upper Extremity Orthotics |
| HEA 344 | Spinal Orthotics I |
| HEA 444 | Spinal Orthotics II |
| HEA 317 | Pathophysiology for O&P (in progress) |
| HEA 342 | Lower Limb Orthotics I |
| HEA 492 | Research and Seminar in O&P |
| HEA 250 | Normal and Pathological Gait-Orthotics |
| HSC 498 | Directed Research in O&P (manufacturer's presentations/visits) |

Prosthetic Certificate Progress: We are now able to accommodate 16 students in our Spring-Summer Prosthetics Certificate Program, which also began in January, 2006. We immediately started using our new gait training area for patient evaluation and gait observation. Under the leadership of Scott Hornbeak, CPO, Dean Rabbitt, CP, and Dino LaCapria, CP, students began formal instruction with a class size of 16. As soon as the privacy curtain was installed in the downstairs cafeteria,

Prosthetics also began to use this space for larger patient evaluation, casting, and critique session. Expendable supplies and materials were purchased to support the laboratory requirements. Teaching occurred in the existing Prosthetics laboratory, which now features a new instructor's bench and 16 training stations.

The following courses were successfully completed in the Prosthetics Certificate through August 1, 2006, and a repeat (Fall-Winter) of these courses is currently underway, with anticipated completion of the current students by February 2007.

| | |
|---------|--|
| HEA 345 | Biomechanics for Orthotics and Prosthetics |
| HEA 355 | Material Science and Applied Anatomy for O&P |
| HEA 335 | Practice Management for O&P |
| HEA 350 | Below Knee Prosthetics I |
| HEA 352 | Below Knee Prosthetics II |
| HEA 354 | Above Knee Prosthetics I |
| HEA 452 | Above Knee Prosthetics II |
| HEA 450 | Upper Extremity Prosthetics (in progress) |
| HEA 492 | Research and Seminar in O&P (in progress) |
| HEA 250 | Normal and Pathological Gait - Prosthetics |
| HSC 498 | Directed Research in O&P (manufacturer's presentations/visits) |

After the program expansion and changes have been implemented in year 1, most second and third activities will focus on program assessment and development of outcome assessment tools in the enlarged program.

Table 1. summarizes the objectives in the Statement of Work, the anticipated Timeline during the 3 year project, and the Accomplishments for Year 1.

TABLE 1. ACCOMPLISHMENT OF OBJECTIVES IN STATEMENT OF WORK

| Objectives/Tasks | Timeline | 11/15/05 – 11/14/06 |
|--|-----------------|---|
| Task 1. To increase the training capacity of a university based Orthotics and Prosthetics practitioner training program from 28 students to 48 students per year. | Month 1-36 | 9 students started Orthotics; 16 students started Prosthetics program on 1/30/06 |
| 1.a. Recruit and hire lead Orthotics instructor. | Months 1-3 | Kate Muller, CPO, actively teaching/leading Orthotics Certificate |
| 1.b. rewrite existing orthotics curriculum to meet outcomes based evaluation standards mandated by National Commission on Orthotics and Prosthetics Education (NCOPE) | Months 1-3 | Orthotics curriculum drafted or updated. Curriculum submitted to NCOPE in May 2006. |
| 1.c. Design and install new Orthotics teaching laboratory. | Month 1-6 | Completed. |
| 1.d. Purchase equipment for Orthotics teaching laboratory. | Month 1- 6 | Digital Camera, CAD/CAM, LASAR Posture, 8 computers, LCD projector. |
| 1.e. Recruit and select first Orthotics certificate class. | Months 1-6 | Completed |
| 1.f. Purchase expendable supplies for orthotics and prosthetics expansion. | Months 1-12 | Approximately 95% of expendable supplies have been purchased. |
| 1.g. Add 4 prosthetic students per year. | Months 1- 12 | Completed |
| 1.h. Teach 32 prosthetic certificate students per year; And 16 orthotic certificate students per year. | Months 13-36 | 41 Graduates of Prosthetic and Orthotic Certificates, Dec. 2006 |

| | | |
|--|---|---|
| Task 2. To perform program evaluation on the effects of increasing program capacity from 28 graduates to 48 graduates per year. | Months 1-36 | Program has expanded from 28 graduates to 41 graduates. Program Evaluation of inputs has started. |
| Objectives/Tasks | Timeline | 11/15/05 – 11/14/06 |
| 2.a. Assess changes in <u>program inputs</u> ; faculty, staff, facilities, equipment, expendable supplies, and budget. | Months 1-12 | Katie Muller, CPO hired. Glenn Ham-Rosebrock, CO hired. Mark Muller, CPO, hired. S. Hornbeak and M. Ramirez contribute 20% time each to Orthotics Program. |
| 2.b Assess changes in <u>activities and processes</u> ; teaching methods, patient models, curriculum changes, student-teacher ratios, advising, and placement. (Months 7-36) | Months 7-36 | Practice Management, Anatomy, Materials Science, Gait, Biomechanics and Research have doubled in capacity Orthotic patient models (with polio) now utilized in Lower Extremity Orthotics I&II. Student-teacher ratios have increased to 16 per 2.5 teachers in all (P) and (O)laboratory courses. Placement into Residency is 100%. Teacher Effectiveness Surveys completed for each class. |
| 2.c. Assess changes in <u>program outputs</u> ; number of people taught, number of graduates, and estimates of orthopedic clients affected. | Months 13-36 | Expanded from 28 graduates in 2005 to 41 graduates in 2006. (46% year over year increase). This increase is ahead of schedule. |
| 2.d. Assess student outcomes: 1. Knowledge (cognitive) and Skills (psychomotor) 2. Behavior (afferent). 3. Values | Months 7-36 Months 13-36 Months 23-36 | Normal cognitive and psychomotor testing underway; new midterms and finals written; new Practical exams in each clinical course written. |
| 2.e Assess <u>outcome targets and indicators</u> ; percent who graduate, percent who achieve “B” or above in cognitive and psychomotor domains; percent who achieve 80% or above in professional behavior, percent who achieve 80% or above on demonstrated core values, percent placed in Residency, and percent who pass ABC certification. | Months 24-36 | 100% of accepted students in O or P Certificates graduated. All scored at “B” or better in cognitive and psychomotor domains. Nothing to report on professional behavior or core values. 100% placed in Residency or returning to school for other discipline. Nothing to report on ABC exams. |
| Task 3. To write, review, and present Program Evaluation to stakeholders. (Months 24-36) | Months 24-36 | Year 1 Quarterly and Annual reports completed; Presentation at Product Line Review at TATRC on July 11, 2006. |

Additional Accomplishments:

1. The Orthotics Certificate Program was planned, curriculum completed, laboratory built, and 9 students were recruited and took the first Certificate at least 6 months ahead of schedule.
2. A Self Study report was submitted to the National Commission on Orthotic and Prosthetic Education for accreditation consideration in May 2006. A site visit was arrange by NCOPE in June

2006, during the last week of Orthotics instruction. In October, the Commission on Accreditation of Allied Healthcare Educational Programs (CAAHEP) awarded the Orthotic Certificate Program full accreditation through 2009. This matches the nationally recognized CAAHEP accreditation of the Prosthetic Certificate Program through 2009.

KEY RESEARCH ACCOMPLISHMENTS:

- New Orthotics Laboratory, O&P classroom, and Gait room completed.
- New faculty recruited to teach Orthotics Program and expanded Prosthetics Program.
- New Orthotics curriculum developed.
- Expendable supplies for O&P instruction ordered.
- 9 students recruited into first Orthotics Certificate; Prosthetic Certificate expanded to 16 students.
- All Midterm and Final Examinations in (O) and (P) rewritten (Cognitive assessment).
- New Practical Exams written and instituted in each clinical (O) and (P) clinical course.
- Development of “Check-out” Sheets for all major projects in Orthotics (Psychomotor assessment).
- Student Exit Survey on effectiveness of Certificate content developed in both O&P.
- Group Focus (Town Hall) Meetings conducted to assess ongoing teaching and learning.
- Patient Model Survey developed for patient models to assess professional behavior of students.

REPORTABLE OUTCOMES:

The purpose of this project is to assess the changes in program inputs, activities and processes, and outputs when an Orthotics and Prosthetics Practitioner training program grows from 28 to 48 graduates per year. Most of Year 1 activities focused on growing the program. But a key aspect of this program evaluation is the development of assessment tools that report student outcomes in Cognitive, Psychomotor, and Behavioral domains. California State University Dominguez Hills anticipates sharing these tools with other Orthotic and Prosthetic Education Programs via presentations at conferences and in written manuscripts. We anticipate presenting the assessment tools to the other O&P educational institutions after the outcome tools are used and improved during the first two years of the project.

The following are reportable outcomes in Year 1 of this project:

Appendix I: Pictures of New Orthotics Laboratory, New O&P Classroom, New Gait Room, Expanded Prosthetics Laboratory and 25 Spring 2006 graduates. Located at host building Ossur North America in Aliso Viejo, CA.

Appendix II: Curriculum Vitae of Kate Muller, CPO; recruited to lead new Orthotics Program.

Appendix III: Sample of new Orthotics Syllabi; Upper Extremity, Spinal I, and Lower Extremity I.

Appendix IV: Samples of new Final Examinations in Upper Extremity Orthotics, Spinal I Orthotics, Lower Extremity I Orthotics, Transtibial (Below Knee) Prosthetics, and Transfemoral (Above Knee) Prosthetics. Samples of new Practical Examinations. Samples of new or revised Check-out Sheets.

Appendix V: Samples of Teacher Effectiveness Surveys given at close of each course.

Appendix VI: Sample Student Exit Survey given at close of Certificate Program.

Appendix VII: Summary of Orthotic Group Focus (Town Hall) Meeting conducted to assess ongoing teaching and learning.

Appendix VIII: Sample of Patient Model Survey; to provide patient feedback on students' professional behavior.

Appendix IX: Evidence of Accreditation; CAAHEP Accreditation of Orthotic and Prosthetic Certificate Education Programs.

CONCLUSION:

There are not enough qualified Prosthetic and Orthotic practitioners to provide services needed by thousands of military amputees, U.S. Veterans, and other Americans living with disabilities. With Department of Defense funding (2005-2008) the California State University Dominguez Hills has started a new Orthotic (orthopedic bracing) program, and increased enrollment in its Prosthetic program. While only eight institutions nationwide currently offer O&P education, the demand for provider services is expected to increase by 25% for orthotic care and 47% for prosthetic care by 2020 (Nielson, 2000). The Department of Defense and the Veterans Administration will directly benefit from greater numbers of qualified prosthetic and orthotic practitioners who work at regional Army and Veterans Administration practices or in private practices that serve Veterans. Currently, there are an average of 200 graduates per year in all O&P practitioner programs in the United States. This project will add 20 graduates per year to this pool, therefore expanding practitioner output by a full 10%.

During Year 1 of this project, several Outcome Assessment Tools were either developed or revised to help assess the students' learning in the cognitive, psychomotor, and behavioral domains. The tools developed include Written Examinations, Practical Examinations, Check-out sheets, end of Certificate Student Surveys, Group Focus Meetings, and Patient Model Surveys. These tools are important new tools that will be shared with other Orthotic and Prosthetic Education programs nationwide. During Year 1 the CSUDH O&P Program also implemented the use of its university Blackboard software, which is an internet access software program where students may view syllabi, course lecture notes, Power Point presentations, drawings, and the like. With Blackboard access, it is possible that a portion of the Orthotics and Prosthetics lectures and demonstrations may be filmed in the future, and students will be assigned to view the lecture(s) before the live portion and patient demonstrations begin.

SO WHAT?

This modest investment of approximately \$500,000 will expand the number of Orthotic and Prosthetic graduates (by 10%) available to serve military amputees, older U.S. Veterans, and other Americans living with disabilities. If distance learning strategies are implemented in the future, even greater numbers of practitioner graduates are feasible. With the new Outcome Assessment Tools developed at CSUDH, other O&P schools should be able to more easily assess their students. These outcome assessment tools are useful in programs that train higher numbers of practitioners, in comparison with the older style programs that only train only 12-14 students per year in laboratory intensive settings.

REFERENCES:

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Palomba, Catherine A., Banta, Trudy W., “*Assessing Student Competence in Accredited Disciplines*”, 2001.

APPENDIX I.

Photographs of new Orthotics Laboratory, new Classroom, new Gait Room, expanded Prosthetics Laboratory and 25 Spring 2006 graduates.



CSUDH Orthotics Laboratory



Students learning under Kate Muller, CPO



Expanded Prosthetics Laboratory



Smart Classroom



New Gait Room



Gait Training on Microprocessor Knee

25 New O&P Practitioners from CSUDH



16 Prosthetic Certificate Graduates – June 2006
9 Orthotic Certificate Graduates – June 2006

16 additional Prosthetic Certificate Students will graduate in December 2006

APPENDIX II.

Curriculum Vitae *Of*

Kate Muller, C.P.O.

23701 Coronel Dr.

Mission Viejo, CA 92691

(949) 380 -1867

home e-mail: mmmulla@msn.com

work e-mail: kmuller@csudh.edu

PROFESSIONAL EXPERIENCE:

Lead Orthotic Instructor

Aug. 2005 – Present

CALIFORNIA STATE UNIVERSITY - DOMINGUEZ HILLS

- PROSTHETIC & ORTHOTIC BACHELOR PROGRAM

- ORTHOTIC CERTIFICATE PROGRAM

Carson and Aliso Viejo, California

- Duties include updating, modifying and creating complete Orthotic curriculum in anticipation of re-instatement of Orthotic Certificate Program beginning Jan. 2006. Curriculum will be for day-to-day instruction of Orthotic courses including lecturing, demonstration, evaluation, casting, fitting, gait assessment, follow-up activities and interaction with volunteer patient models.

Courses of instruction for the Certificate program are:

-HEA 250: Normal and Pathological Gait for Orthotics*

-HEA 317: Pathophysiology for Orthotics*

-HEA 340: Lower Limb Orthotics I

-HEA 342: Lower Limb Orthotics II

-HEA 344: Spinal Orthotics I

-HEA 345: Biomechanics and Kinesiology for O & P*

-HEA 355: Practice Management for Prosthetics and Orthotics*

-HEA 440: Upper Limb Orthotics

-HEA 442: Lower Limb Orthotics III

-HEA 444: Spinal Orthotics II

-HEA 492: Research & Seminar in O & P

-HEA 493S: Preceptorship in Orthotics and Prosthetics*

-HEA 495: Special Topics in Health Sciences*

-HEA 498: Directed Research in O & P*

*Italized courses are taught by and the responsibility of additional staff.

- Responsible for creating and maintaining quality assurance of all testing materials and grading for the Orthotic Certificate courses.
- Responsible for arranging and scheduling guest lecturers and presenters.

Prosthetic Instructor

Oct. 2003 – Present

CALIFORNIA STATE UNIVERSITY - DOMINGUEZ HILLS

- PROSTHETIC & ORTHOTIC BACHELOR PROGRAM

- PROSTHETIC CERTIFICATE PROGRAM

Carson and Aliso Viejo, California

- Part-Time Instructor of courses for both the Bachelor and Certificate Prosthetic programs. Duties include providing day-to-day instruction of prosthetic courses including lecturing, demonstration, evaluation, casting, fitting, gait assessment, follow-up activities and interaction with volunteer patient models.

Courses of instruction for the Bachelor program are:

-HEA 205: Introduction to Orthotics & Prosthetics

-HEA 231: Clinical Protocols for O & P

Courses of instruction for the Certificate program are:

-HEA 355: Practice Management for Prosthetics and Orthotics

-HEA 350: Trans Tibial Prosthetics I

-HEA 352: Trans Tibial Prosthetics II

-HEA 354: Trans Femoral Prosthetics I

-HEA 452: Trans Femoral Prosthetics II

-HEA 450: Upper Extremity Prosthetics

-HEA 492: Research & Seminar in O & P

- Responsible for updating and maintaining quality assurance of all testing materials and grading for the Prosthetic Certificate courses.

- Assisted with the preparation for the CAAHEP re-accreditation self-study report and 5-year site visit of the Prosthetic program in the Spring of 2004.

Certified Prosthetic & Orthotic Practitioner

Aug. 2001 – June 2003

SOUTHERN CALIFORNIA ORTHOTICS & PROSTHETICS, INC. (SCOPE)

Children's Hospital, San Diego, CA

Specializing in Pediatric Orthotics and Prosthetics

- Assisted in the acquisition and start up of a new office at Children's Hospital.
- Organized and directed numerous in-services with the Pediatric Orthopedic group, Physical & Occupational Therapy department, Cast Room and Authorization offices at Children's Hospital.
- Guest lecturer at Mesa College, San Diego, CA, for the Physical Therapy Assistant program; topics of discussion were "Prescription Criteria for Spinal Orthoses" and "Prescription Criteria for Lower Extremity Orthotics".

Certified Prosthetic & Orthotic Practitioner

Jan. 1997 – July 2001

SOUTHERN CALIFORNIA ORTHOTICS & PROSTHETICS, INC. (SCOPE)

Headquarters, Kearny Mesa, CA

General Orthotic and Prosthetic care

Orthotic Resident July 1995 –June 1996
UNIVERSITY OF MICHIGAN ORTHOTIC PROSTHETIC CENTER
Ann Arbor, Michigan

Clinical Rotations Aug. 1996 – Dec. 1996
NORTHWESTERN UNIVERSITY Jan. 1995 – May 1995
Chicago, Illinois

Orthotic/Prosthetic Technician Nov. 1993 – Dec. 1994
ORTHOTIC/PROSTHETIC CONSULTANTS
Tulsa, Oklahoma

CERTIFICATION:

Certified Prosthetist Dec. 1999
Certified Orthotist June 1997
AMERICAN BOARD FOR CERTIFICATION
Alexandria, Virginia

EDUCATION:

Certificate in Prosthetics Dec. 1996
Certificate in Orthotics May 1995
NORTHWESTERN UNIVERSITY PROSTHETIC-ORTHOTIC CENTER
Chicago, Illinois

Bachelor of Arts in Chemistry May 1993
Bachelor of Arts in Human Biology
UNIVERSITY OF KANSAS
Lawrence, Kansas

RELATED CERTIFICATIONS AND SEMINARS:

- Orthotic Management of the Unstable Spine
- ARGO Seminar
- Diabetic Wound Care Management
- Athletic Orthotic Management
- Up and About Seminar
- Boston Brace scoliosis systems
- Cascade DAFO Systems
- Otto Bock Myoelectric devices
- VASS, Harmony socket, TEC interface system
- Orthomerica STARband Cranial Remolding Orthosis system
- Orthomerica DAFO system
- AirCast and FloTech IPOP systems
- DeRoyal Range of Motion Products
- Don Joy Orthopedic bracing
- Townsend Bracing Systems
- Silipos Silicone Devices
- AOPA's Coding & Billing Seminar
- Ohio Willow Wood lower limb systems

APPENDIX III.
Samples of New Orthotic Syllabi

UPPER LIMB ORTHOTICS SYLLABUS
HEA 440
Spring 2006

FACULTY: Kate Muller, C.P.O.
Glenn Ham-Rosebrock, C.O.

TELEPHONE: (949) 643-5374

E-MAIL: kmuller@csudh.edu
ghamrosebrock@csudh.edu

LOCATION: CSUDH O & P Program Laboratory at Ossur Campus

TIME: Mon. – Fri., 8:00 am – 3:00 to 5:00 pm,
3 weeks & 1 day.

OFFICE HOURS: By appointment

Course Description: Upper Limb Orthotics; Evaluation, designing, fabricating, fitting and modifying of custom made and off-the-shelf Upper Limb Orthoses. Overview of Upper Limb pathology, medical management and prescription considerations.

Units/Hours: 2 Units. Course consists of 90 hours of lecture and laboratory activity per week plus a Final Examination.

Required Text:

- CSUDH Upper Extremity Orthotics Manual, Spring 2006 (Provided)
- Atlas of Orthotics, Third Edition, Mosby, 1997.

Recommended Text: Salter's Musculoskeletal Disorders

Course Objectives:

1. The course is designed to:
 - a. Review the anatomy, range of motion, and biomechanics relevant to upper extremity fittings.
 - b. Help the student gain an understanding of terminology, patient handling, exam techniques, measurements and orthometry forms for various orthoses.
 - c. Give the student an understanding of impression taking and model modification techniques for custom-made hand and wrist-hand orthoses.
 - d. Give the student an understanding of design and prescription recommendations.
 - e. Review the components, alignment and fabrication processes for upper extremity orthoses.
 - f. Acquaint the student with radiographic procedures relevant to orthotic design and fitting.
 - g. Give the student an understanding of the evaluation and modification techniques available to fit off-the-shelf upper extremity orthoses.

2. Upon completion of this course, the student will:
 - a. Be able to evaluate a patient for an off-the-shelf or custom-made Upper Extremity Orthosis.
 - b. Be able to discuss Upper Extremity Orthoses' design and provide biomechanical rationale for each device.
 - c. Develop an understanding of various casting and impression techniques used in Upper Extremity Orthotics.
 - d. Be able to choose components and materials, fabricate and fit the Upper Extremity Orthosis.

Course Content:

Project 1 = Rancho Style Metal Hand Orthosis
 Project 2 = Rancho Style Metal Wrist Hand Orthosis
 Project 3 = Thermoplastic Wrist Hand Orthosis
 Project 4 = Wrist Driven or Ratchet or Wrist Action Wrist Hand Orthosis

Evaluation of Learning and Grading Criteria:

Grading

| | |
|--|------|
| Quizzes (3) | 15% |
| Pathology Presentation | 11% |
| Final exam | 20% |
| Project 1 | 11% |
| Project 2 | 11% |
| Project 3 | 11% |
| Project 4 | 11% |
| Professionalism, punctuality & participation | 10% |
| | 100% |

Regular attendance is required for all classes. The absent student will be responsible for informing the program by calling the program's telephone number, (949) 643-5374, before the start of any class. A prior request shall be made to the instructor for non-emergency absences. Any absence from class requires that the missed material, quizzes and tests be made up, by arrangement with the course instructor. The student is responsible for all missed class material on subsequent quizzes and tests.

Program Grading Policy:

The letter grade for the course will be based upon the following:

| | | | |
|----|--------|----|--------|
| A | > 90% | B- | 80-82% |
| A- | 90-92% | C+ | 77-79% |
| B+ | 87-89% | C | 73-76% |
| B | 83-86% | F | < 72% |

HEA 344
SPINAL ORTHOTICS I
Spring 2006

FACULTY: Kate Muller, C.P.O.
Glenn Ham-Rosebrock, C.O.

TELEPHONE: (949) 643-5374

E-MAIL: kmuller@csudh.edu
ghamrosebrock@csudh.edu

LOCATION: CSUDH Clinical O & P Laboratory at Aliso Viejo Campus

TIME: Monday – Thursday, 8:00 – 3 or 5:00 pm,
3 weeks

OFFICE HOURS: By appointment

Course Description: Spinal Orthotics; Evaluation, designing, fabricating, fitting and modifying of custom made and off-the-shelf Spinal Orthoses. Overview of spinal pathology, medical management and prescription criteria.

Units/Hours: 3 Units. Course consists of 55 hours of lecture and 54 hours of laboratory activity plus and additional 6 hours of examinations and quizzes.

Required Text:

- CSUDH Spinal Orthotics I Manual, Spring 2006 (Provided).
- Atlas of Orthotics, 3rd Edition, Mosby, 1997.

Recommended Text: Salter's Musculoskeletal Disorders

Course Objectives:

1. The course is designed to:
 - h. Review the anatomy, range of motion, and biomechanics relevant to spinal orthoses fittings.
 - i. Help the student gain an understanding of terminology, patient handling, exam techniques, measurements and orthometry forms for various orthoses.
 - j. Give the student an understanding of impression taking and model modification techniques for custom-made spinal orthoses.
 - k. Give the student an understanding of design and prescription recommendations.
 - l. Review the components, alignment and fabrication processes for spinal orthoses.
 - m. Acquaint the student with radiographic procedures relevant to orthotic design and fitting.
 - n. Give the student an understanding of the evaluation and modification techniques available to fit off-the-shelf spinal orthoses.
2. Upon completion of this course, the student will:
 - e. Be able to evaluate a patient for a custom-made or off-the-shelf spinal orthosis.
 - f. Be able to discuss spinal orthoses' design and provide biomechanical rationale for each device.

- g. Develop an understanding of various casting and impression techniques used for spinal orthotics.
- h. Be able to choose components and materials, fabricate and fit spinal orthoses.

Course Content:

Project 1 = LSO Corset fitting
 Project 2 = LSO Sagittal/Coronal Control (Knight)
 Project 3 = Jewitt &/or CASH fitting
 Project 4 = Overlap LSO or Bivalved TLSO
 Project 5 = SOMI &/or Minerva fitting
Project 6 = off-the-shelf TLSO/LSO 'mini critique'--- Not graded

Evaluation of Learning and Grading Criteria:

Grading

| | |
|--|-----------|
| Quizzes (3) | 18% |
| Final exam | 25% |
| Project 1 | 8% |
| Project 2 | 8% |
| Project 3 | 8% |
| Project 4 | 8% |
| Project 5 | 8% |
| Case Study Problem Sets (2 sets) | 12% |
| Professionalism, punctuality & participation | <u>5%</u> |
| | 100% |

Regular attendance is required for all classes. The absent student will be responsible for informing the program by calling the program's telephone number, (949) 643-5374, before the start of any class. A prior request shall be made to the instructor for non-emergency absences. Any absence from class requires that the missed material, quizzes and tests be made up, by arrangement with the course instructor. The student is responsible for all missed class material on subsequent quizzes and tests.

Program Grading Policy:

The letter grade for the course will be based upon the following:

| | | | |
|----|--------|----|--------|
| A | > 90% | B- | 80-82% |
| A- | 90-92% | C+ | 77-79% |
| B+ | 87-89% | C | 73-76% |
| B | 83-86% | F | < 72% |

Academic Integrity and Plagiarism:

Academic integrity is of central importance in the University community and involves committed allegiance to the values, principles, and code of behavior held to be central in that community. Integrity concerns honesty and implies being truthful, fair, and free from lies, fraud, and deceit. The core of a University's integrity is its scholastic honesty.

Plagiarism means copying of another person's work, or having someone else write a paper for you, falsely calling yourself the author and paraphrasing or copying text without proper citations. Plagiarism is considered a gross violation of the University's academic and disciplinary standards.

Cheating and plagiarism are cause for formal University discipline and is justification for an instructor to fail the student or assign a lower grade. Refer to the current University Catalog for a more complete description of academic dishonesty and plagiarism.

HEA 340
LOWER EXTREMITY ORTHOTICS I
Spring 2006

FACULTY: Kate Muller, C.P.O.
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TELEPHONE: (949) 643-5374

E-MAIL: kmuller@csudh.edu
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LOCATION: CSUDH Clinical O & P Laboratory at Aliso Viejo Campus

TIME: Monday – Thursday, 8:00 – 3 or 5:00 pm,
5 weeks

OFFICE HOURS: By appointment

Course Description: Lower Extremity Orthotics. Evaluation, designing, fabricating, fitting and modifying of custom made Foot Orthoses, UCBLs and AFOs. Overview of Lower Extremity pathology, medical management and prescription criteria.

Units/Hours: 3 Units. Course consists of 75 hours of lecture and 45-50 hours of laboratory activity plus and additional 4 hours of examinations and quizzes.

Required Text:

- CSUDH Lower Extremity Orthoses I Manual, Spring 2006 (Provided).
- Atlas of Orthotics, 3rd Edition, Mosby, 1997.

Recommended Text:

- Textbook of Disorders and Injuries of the Musculoskeletal System; 3rd ed.; 1999; Salter; Lippencot, Williams & Wilkins.
- Muscle Testing: Techniques of Manual Examination; 7th ed.; 2002; Hislop & Montgomery; Saunders – An Imprint of Elsevier.

Course Objectives:

1. The course is designed to:
 - o. Review the anatomy, range of motion, and biomechanics relevant to lower limb orthotic fittings.
 - p. Help the student gain an understanding of terminology, patient handling, exam techniques, measurements and orthometry forms for various orthoses.
 - q. Give the student an understanding of impression taking, model modification techniques, or paper tracing with corrections for custom-made lower limb orthoses.
 - r. Give the student an understanding of design and prescription recommendations.
 - s. Review the components, alignment and fabrication processes for various lower limb orthoses.

Updated 6 – '06

- t. Evaluate patients for foot orthoses and ankle foot orthoses with an emphasis on properly managed tissues to tolerate pressures.
 - u. Discuss and describe AFO design and provide biomechanical rationale for control or correction.
2. Upon completion of this course, the student will:
- i. Be able to evaluate a patient for a custom-made foot orthosis or ankle foot orthosis.
 - j. Be able to discuss lower limb orthoses' design and provide biomechanical rationale for each device.
 - k. Develop an understanding of various casting and impression techniques used for lower limb orthotics.
 - l. Be able to choose components and materials, fabricate and fit lower extremity orthoses.

Course Content:

Project 1 = Cork Foot Orthoses
 Project 2 = UCBL Foot Orthoses
 Project 3 = Double Upright AFO
 Project 4 = Plastic AFO
 Project 5 = Axial Resist AFO casting technique
 Project 6 = Floor Reaction AFO

Evaluation of Learning and Grading Criteria:

Grading

| | |
|--|------------|
| Quizzes (4) | 20% |
| Final exam | 20% |
| Project 1 | 9% |
| Project 2 | 9% |
| Project 3 | 9% |
| Project 4 | 9% |
| Project 5 | 5% |
| Project 6 | 9% |
| Professionalism, punctuality & participation | <u>10%</u> |
| | 100% |

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Program Grading Policy:

The letter grade for the course will be based upon the following:

| | | | |
|----|--------|----|--------|
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| A- | 90-92% | C+ | 77-79% |
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APPENDIX IV.
Samples of Final Examinations

UPPER LIMB ORTHOTICS
Final Exam
Spring 2006

Name: _____

Multiple Choice: Choose the one, best answer for each multiple choice question. 1 point each.

1. The _____ helps prevent distal migration of a WHO or HO.
 - a. wrist strap
 - b. thumb adduction stop
 - c. dorsal bar
 - d. radial extension

2. Which of the following is NOT an elbow flexor?
 - a. Biceps Brachii
 - b. Brachialis
 - c. Brachioradialis
 - d. Coracobrachialis

3. The Extensor Carpi Ulnaris works synergistically with the _____ to provide wrist extension.
 - a. Palmaris Brevis
 - b. Palmaris Longus
 - c. Extensor Digitorum
 - d. Flexor Carpi Ulnaris

4. One advantage that the dorsal style WHO has over a volar style WHO is that it:
 - a. allows tactile sensation.
 - b. accentuates the palmar arch.
 - c. suspends well.
 - d. provides joint stimulation.

5. Both the dorsal and palmar interossei are innervated by what spinal root levels?
 - a. C₅ – C₆
 - b. C₆ – C₇
 - c. C₇ – C₈
 - d. C₈ – T₁

6. The volar surface of the forearm contains the _____ muscles which, as a group, originate at the _____ humeral epicondyle.
 - a. intrinsic; lateral
 - b. elbow extensor; lateral
 - c. wrist flexor; medial
 - d. wrist extensor; medial

7. Which of the following nerves innervates all of the anterior muscles of the upper arm?
- Radial Nerve
 - Median Nerve
 - Suprascapular Nerve
 - Musculocutaneous Nerve
8. A dynamic IP extension assist with an MP extension stop should be used if a patient:
- is unable to extend MPs 2-5.
 - hyperextends MPs 2-5.
 - has lumbricles weakness and hyperextends MPs 2-5.
 - has long extensor weakness.
9. The 2nd MP joint is abducted by the:
- 1st palmar interosseus.
 - 1st dorsal interosseus.
 - 2nd palmar interosseus.
 - 2nd dorsal interosseus.
10. The glenohumeral joint most commonly dislocates when:
- adducted and externally rotated.
 - abducted and externally rotated.
 - abducted and internally rotated.
 - adducted and internally rotated.
11. How is the subluxed shoulder typically managed in hemiplegia?
- shoulder abduction orthosis
 - sling
 - balanced forearm orthosis
 - axillary crutch
12. The most common MP joint deformity for digits 2-5 in Rheumatoid Arthritis is:
- dorsal subluxation and ulnar deviation.
 - radial deviation and hyperextension.
 - volar subluxation and ulnar deviation.
 - ulnar deviation and hyperextension.
13. Klumpke's palsy is typified by weakness, paralysis of the:
- entire brachial plexus.
 - shoulder girdle and arm muscles.
 - hand intrinsic and long flexor muscles.
 - sternocleidomastoid muscle.
14. The mobile segments of the hand's transverse arch are metacarpals:
- 3 - 4.
 - 1 - 2 - 3.
 - 1 - 4 - 5.
 - 1 - 5.

15. A swan neck deformity causes the PIP joint to:
- flex and DIP joint to extend.
 - hyperextend and the DIP joint to flex.
 - hyperextend and the DIP joint to hyperextend.
 - flex and the DIP joint to flex.
16. An MP extension assist could be used for:
- Ulnar nerve injury at the elbow.
 - Medial nerve injury at the wrist.
 - zero to poor extrinsic extensors.
 - none of the above.
17. A Wrist Driven WHO for a C6 quadriplegic would be powered by:
- Flexor Carpi Radialis and Ulnaris.
 - Extensor Carpi Radialis Longus and Brevis.
 - Extensor Carpi Radialis and Ulnaris.
 - Extensor Digitorum and Extensor Indicis Proprius.
18. A Boutonniere deformity consists of PIP:
- and DIP extension.
 - flexion and DIP extension.
 - and DIP flexion.
 - hyperextension and DIP flexion.
19. In using the Wrist Driven Tenodesis Orthosis, wrist:
- flexion causes MP flexion.
 - extension causes IP flexion.
 - extension causes MP flexion.
 - extension cause IP extension.
20. The type of prehension provided by a Wrist Driven Tenodesis orthosis is:
- three-jaw chuck.
 - cylindrical.
 - hook.
 - lateral.
21. Combined MP flexion and IP extension of digits 2-5 are performed primarily by:
- lumbricals, assisted by interossei.
 - flexor digitorum profundus and sublimis.
 - flexor digiti minimi and extensor digitorum communis.
 - none of the above.
22. The most important motor acquisition of the C5 quadriplegic is:
- shoulder and elbow extension.
 - shoulder depression.
 - shoulder abduction.
 - shoulder and elbow flexion.

23. The most important sensory distribution in the hand is along the:
- Ulnar nerve.
 - Radial nerve.
 - Median nerve.
 - 'a' & 'b'.
24. Which muscle abducts the scapula?
- Rhomboids
 - Supraspinatus
 - Serratus Anterior
 - Latissimus Dorsi
25. A peripheral nerve injury at the wrist of the ulnar nerve could be orthotically managed with a:
- long opponens (WHO)
 - short opponens (HO) with MP extension stop.
 - short opponens (HO) with thumb adduction stop.
 - short opponens (HO).
26. Name the most characteristic clinical sign of Left CVA, Right Hemiplegia.
- Right side neglect.
 - Passive tremors.
 - Aphasia.
 - Neurotmesis.
27. The following nerve roots form the Brachial Plexus:
- C₁ – C₇.
 - C₅ – T₁.
 - C₆ – C₈.
 - C₁ – T₁.
28. The Thenar Eminence musculature is innervated by the:
- Ulnar nerve.
 - Median nerve.
 - Radial nerve.
 - Musculocutaneous nerve.
29. The two functions of the Biceps Brachii are:
- elbow flexion and forearm extension.
 - elbow flexion and forearm pronation.
 - elbow flexion and shoulder extension.
 - elbow flexion and forearm supination.
30. The main reason the thumb adduction stop is placed on a Wrist Driven Tenodesis Orthosis for a quadriplegic would be:
- prevents cutting into the web space.
 - maintains the thumb in adduction.
 - prevents distal migration of the orthosis.
 - prevents dislocation of the orthosis.

31. In the Ratchet type Wrist Driven WHO, the variable locking mechanism:
- transfers wrist extension power.
 - maintains prehension.
 - transfers finger extension power.
 - actively allows finger flexion.
32. The desirable length of a thumb post is:
- to the thumb IP joint.
 - proximal to the IP joint.
 - to the nail bed.
 - just into the nail bed.
33. The TIRR system is different from the IRM or Rancho in that it uses more extensively:
- thermosets.
 - thermoplastics.
 - metal kits.
 - low temperature plastics.
34. The MP extension stop for digits 2-5 should be fitted:
- proximal to the PIP joints of digits 2-5.
 - distal to the PIP joints of digits 2 – 5.
 - over the MP joints of digits 2 – 5.
 - halfway between the PIP and DIP joints of digits 2 – 5.
35. A 'Claw Hand' deformity is the result of injury to what nerve(s)?
- Axillary
 - Median and/or Ulnar
 - Radial and/or Axillary
 - Radial
36. Abduction and Adduction occur WITHIN the hand at the:
- metacarpophalangeal joints.
 - carpophalangeal joints.
 - Radioulnar joint.
 - interphalangeal joint.
37. In the forearm, most of the long extensors are innervated at which spinal cord level?
- C₅
 - C₆
 - C₇
 - C₈
38. Which type of orthosis would be used to manage a patient with skin grafts in the axilla region?
- functional arm orthosis
 - Shoulder Abduction orthosis
 - SEWHO: cable driven
 - Axillary sling

39. Which of the following muscles is an internal rotator of the arm?
- Posterior Deltoid
 - Subscapularis
 - Teres Minor
 - Infraspinatus
40. What nerve innervates Teres Major?
- Subscapular
 - Thoracodorsal
 - Axillary
 - Long Thoracic
41. The collateral ligaments of MPs 2-5 are taut when the joint is in:
- neutral.
 - flexion.
 - extension.
 - none of the above.
42. A Wrist Extension Assist (also known as a Wrist Action) WHO could be used at what nerve damage level?
- Radial nerve, mid humeral level.
 - Musculocutaneous, mid humeral level.
 - Lateral cord, Brachial plexus level.
 - Erb's palsy type paralysis.
43. All of the following statements about power grasp are true EXCEPT:
- MPs are flexed.
 - PIPs are flexed.
 - wrist joint is radially deviated.
 - thumb MP is flexed.
44. What orthosis would be used for a 4-week post burn to the entire volar aspect of the wrist and hand?
- WHO – gauntlet style
 - WHO – dorsal style, resting
 - WHO – Rancho style, static
 - WHO – volar style, resting
45. A Radial nerve injury might require what additional component for the thumb on a hand orthosis?
- 1st MP abduction assist
 - 2nd MP adduction assist
 - MP stop
 - thumb post
46. Two muscles act to abduct the shoulder...one is the Deltoid and the other muscle is the:
- Infraspinatus.
 - Supraspinatus.
 - Subscapularis.
 - Teres Major.

47. All of these statements can be made about the Glenohumeral joint EXCEPT:
- it is a ball and socket joint.
 - shoulder abduction is optimal when elevation is in the plane of the scapula.
 - humeral head is anteverted in the glenoid fossa.
 - glenoid labrum is considered part of the glenohumeral complex.
48. The total arc of motion of the wrist joint in the coronel plane is:
- 30°.
 - 50°.
 - 60°.
 - 70°.
49. The Upper Limb orthosis, as well as any orthosis, serve to:
- assist.
 - protect.
 - correct.
 - all of the above.
50. Extensor digitorum communis is the primary antagonist for what 3 muscles to maintain muscle balance of the hand?
- abductor pollicis longus, lumbricals and interossei
 - lumbricals, flexor digitorum profundus and adductor pollicis
 - interossei, flexor digitorum profundus and flexor hallicis brevis
 - flexor digitorum profundus, flexor digitorum superficialis and lumbricles.
51. The roots of the Median nerve stem from _____ while the roots of the Radial nerve stem from _____.
- C₆ – T₁; C₆ – T₁.
 - C₅ – C₆; C₆ – T₁.
 - C₆ – T₁; C₈ – T₁.
 - C₅ – C₇; C₈ – T₁.
52. A 'MP Stop' is also known as:
- Lumbrical assist.
 - Dennis brown bar.
 - Lumbrical bar.
 - the 'Starship Enterprise'.
53. A person presents with Mallet finger will be unable to:
- flex the DIP joint.
 - extend the DIP joint.
 - flex and extend the DIP joint.
 - none of the above.
54. For someone with weak or absent wrist extensors, the wrist can be positioned by:
- wrist driven WHO.
 - passive WHO.
 - external power WHO.
 - all of the above.

55. The most common mechanism of injury for shoulder dislocation in the athlete is:
- external rotation, abduction and extension of the shoulder.
 - internal rotation, adduction and flexion of the shoulder.
 - external rotation, adduction and flexion of the shoulder.
 - none of the above.
56. A C6 quadriplegic would have all of the following intact EXCEPT:
- Biceps
 - Deltoids
 - Extensor Carpi Ulnaris
 - Pronator Teres
57. Tennis elbow exhibits inflammation most commonly at what bony landmark?
- Medial epicondyle
 - Lateral epicondyle
 - Capitulum
 - Trochlea
58. What weak muscle results in “winging” of the scapula?
- External rotators
 - Deltoid
 - Latissimus dorsi
 - Serratus anterior
59. Which of the following components will be used by a patient with:
- Intrinsics = ‘zero to poor’
 Extensor digitorum = ‘fair to normal’
 Flexor digitorum superficialis and profundus = ‘fair to normal’
- MP extension assist
 - MP flexion assist
 - MP flexion stop
 - MP extension stop
60. A patient presents to you with a metal Hand Orthosis. Muscle strength is:
- Thumb abductors = ‘zero to poor’
 Thumb adductors & long extensors & flexors = ‘fair to normal’
- Range of motion of the thumb is within normal limits. What additional component should be used?
- Opponens bar
 - Thumb post
 - Thumb abduction assist
 - Frist dorsal interosseous assist
61. Which muscle is NOT part of the Thenar eminence?
- Abductor pollicis brevis
 - Abductor pollicis longus
 - Opponens pollicis
 - Flexor pollicis brevis (superficial head)

62. All of the following are palpable anatomic structures EXCEPT:

- a. Radial styloid.
- b. Intercarpal joints.
- c. Long Flexor tendons.
- d. Ulnar styloid.

63. The first dorsal interosseous assist:

- a. is used if the first dorsal interosseous is fair to good.
- b. abducts the second digit to oppose the thumb.
- c. adducts the second digit to oppose the thumb.
- d. none of the above.

Matching for items 1 – 5 below: From the list, select the orthotic component that might be used in the managing the following clinical presentations. Answers are only used once. 1 point each.

- 1. Flattened palm _____
- 2. Adducted 2nd digit _____
- 3. Tight web space _____
- 4. Thumb abduction weakness _____
- 5. Flail thumb _____

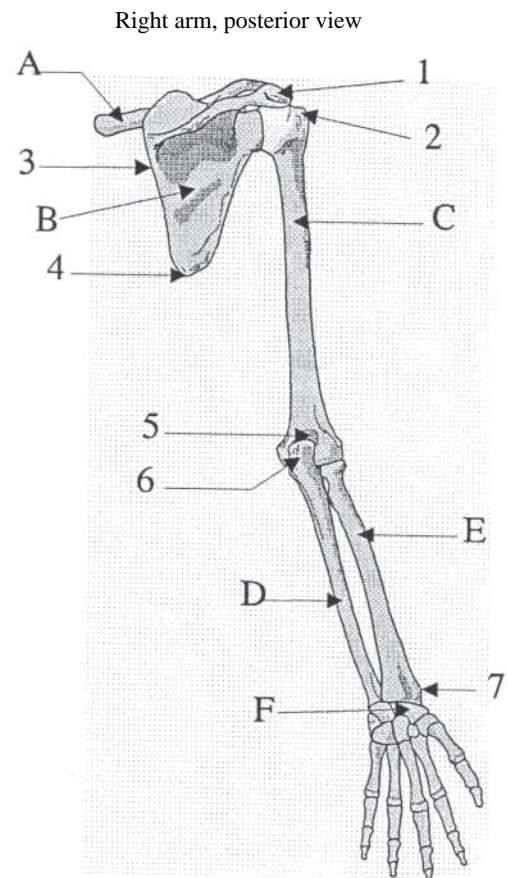
- a. Thumb Adduction Stop
- b. Opponens Bar
- c. Palmar Bar
- d. 1st dorsal interosseous assist
- e. 1st MP abduction stop
- f. Thumb post

Identify the bones labeled A-F. 1 point each.

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____

Identify the landmarks labeled 1 – 7. 1 point each.

- 1. _____
- 2. _____
- 3. _____
- 4. _____



5. _____
6. _____
7. _____

Short Answer: For each of the following questions, please give a brief answer.

1. A patient presents to you with neurotmesis (damage to the internal structural framework of the nerve as well as the axon) of the Median nerve. Regeneration of return is highly unlikely. Name the orthotic recommendations. Is this recommendation for interim or definitive use? (2 points)

2. Briefly describe “Functional Position” of the wrist and hand. (3 points)

3. What are three of the specific purposes of the device in Figure 1? (3 points)

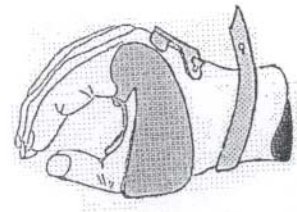


Figure 1

4. What is the purpose of the “C Bar” in Figure 1? (1 point)

5. There are three different treatment objectives that might be considered for the WAWHO (refer to Figure 2) and they are.....(3 points)

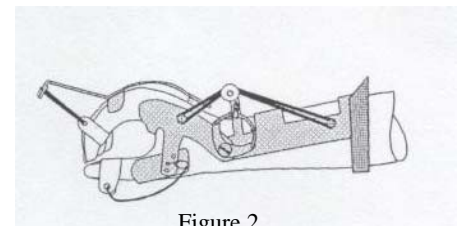


Figure 2

6. If extension assists were used for the wrist, fingers and thumb for the orthosis in Figure 2, what injury would you likely be treating? (1 point)

7. What is the main purpose of the orthosis in Figure 3? (3 points)

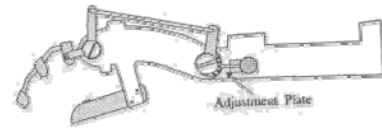


Figure 3

8. What is another description of the movable mechanism on this device? (1 point)

9. The neurological level of a patient who would benefit from this orthosis would be: (1 point)

10. If the injury were one level higher (superior), would this device still be appropriate? If not, why and what changes would need to be done to the orthotic design? (3 points)

11. Name four articulations of the glenohumeral joint. (4 points)

12. What muscle is the primary pronator of the forearm? (1 point)

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Name: _____

MATCHING: For each vertebral function in the Column A match the letter from Column B which identifies the vertebral part. There is only one answer for each numbered item. Each item from Column B may only be used once. (1 point each)

- | | | |
|---|-------|---------------------------------------|
| 1. Functions to support weight | _____ | a. Spinous process |
| 2. Lamina join to form this | _____ | b. Lamina |
| 3. Present in Thoracic vertebrae | _____ | c. Pars interarticularis |
| 4. Allows range of motion between vertebrae | _____ | d. Pedicles |
| 5. Fracture of _____ is spondylolysis | _____ | e. Body |
| | | f. Inferior/Superior articular facets |
| | | g. Rib facets |

MATCHING: For each pathology's description in Column A match the letter from Column B which identifies the pathology. There is only one answer for each numbered item. Each item from Column B may only be used once. (1 point each)

- | | | |
|---|-------|-------------------------------|
| 6. Bacteria which attacks the cancellous bone of _____ the vertebral body. | _____ | a. Torticollis |
| 7. Contracture of the sternocleidomastoid | _____ | b. Spondylolisthesis |
| 8. Progressive fusion of vertebral joints | _____ | c. Rheumatoid arthritis |
| 9. Anterior displacement of one vertebral body | _____ | d. Ankylosing spondylitis |
| 10. Systemic disease; affects synovium | _____ | e. Osteoarthritis |
| 11. Localized disorder; affects articular cartilage | _____ | f. Herniated nucleus pulposus |
| | | g. Tuberculosis |
| | | h. Sacralization |

MATCHING: For each of the common names for spinal orthoses in Column A match the letter from Column B that corresponds to the appropriate plane control description. There is only one answer for each numbered item. Each item from Column B may only be used once. (1 point each)

- | | | |
|------------------------|-------|-----------------------------------|
| 12. Chairback Orthosis | _____ | a. TLSO: Anterior Control |
| 13. Williams Orthosis | _____ | b. TLSO: Sagittal/Coronal Control |
| 14. Jewett Orthosis | _____ | c. CO: Sagittal/Coronal Control |

- | | | |
|----------------------------|-------|-----------------------------------|
| 15. Cowhorn Orthosis | _____ | d. LSO: Sagittal Control |
| 16. Knight-Taylor Orthosis | _____ | e. TLSO: Triplaner Control |
| 17. Four Poster Orthosis | _____ | f. LSO: Posterior/Coronal Control |

MULTIPLE CHOICE: For each of the following, choose the one best answer. (1 point each)

18. Which statement about the LS Corset is incorrect?
 - a. The corset can increase intra-abdominal pressure.
 - b. The corset simulates the function of the abdominal muscles.
 - c. A corset is used most effectively during times of rest.
 - d. Proper corseting and exercise are important to successful treatment of low back pain.
 19. Transverse plane motion is best controlled by which of the following?
 - a. Williams Orthosis
 - b. Taylor Orthosis
 - c. Cowhorn Orthosis
 - d. All of the above
 20. Which statement about the Oblique Bars in the LSO Posterior/Coronal Control is false?
 - a. Is attached superiorly to the thoracic band.
 - b. Maintains a 'Hold Variable' in the transverse plane.
 - c. Its purpose is to provide structural integrity to the orthosis.
 - d. It requires multiple contours.
 21. The TLSO: Sagittal Control was originally developed for which pathology?
 - a. Scoliosis
 - b. Kyphosis
 - c. Tuberculosis
 - d. Osteoporosis
 22. Which component is not used in the LSO: Posterior/Coronal Control?
 - a. Elastic Pelvic Strap
 - b. Oblique Bar
 - c. Anterior Corset Panel
 - d. Dynamic Lateral Bar
 23. Myeloma is defined as:
 - a. inflammation of the muscle.
 - b. hazing over the cornea of the eye.
 - c. tear in muscle fibers.
 - d. a malignant disease.
 24. Normal aging of the joints is known as _____ and is more likely to appear in _____ and _____.
- a. Rheumatoid Arthritis; synovial joints; tendon sheaths.
 - b. Osteoarthritis; weight bearing joints; loading areas.
 - c. Osteoporosis; cancellous bone; older people.
 - d. incontinence; bladder; bowel.

25. The motion controlled the most by a SOMI is:
- flexion.
 - extension.
 - lateral flexion.
 - rotation.
26. The Polio virus attacks the _____ of the spinal cord.
- meninges
 - ventral horn cells
 - dorsal horn cells
 - dorsal root ganglion
27. A degenerative joint disease that affects the articular cartilage is:
- Osteoarthritis.
 - Osteomalacia.
 - Ankylosing spondylitis.
 - Osteoporosis.
28. A condition in which muscle 'wastes away' is:
- atonia.
 - atrophy.
 - areflexia.
 - anesthesia.
29. When fitting spinal orthoses, excessive hip development will most likely cause the orthosis to:
- rotate.
 - migrate superiorly.
 - migrate inferiorly.
 - both 'a' and 'c'.
30. The placement of the inferior border of the pelvic band should be:
- at the gluteal fold.
 - 24 mm or 1 inch inferior to the sacrococcygeal junction.
 - 24 mm or 1 inch superior to the sacrococcygeal junction.
 - at the sacrococcygeal junction.
31. Placement of the thoracic band should be 24 mm or 1 inch:
- inferior to the most inferior angle of the scapula.
 - superior to the inferior angle of the scapula.
 - inferior to the spine of the scapula.
 - superior to the spine of the scapula.
32. The method to determine the 'baseline' for a corset measurement is:
- (xiphoid to waist) \div 2.
 - (inferior costal margin to trochanter) \div 2.
 - (iliac crest to trochanter) \div 2.
 - (inferior costal margin to iliac crest) \div 2.

33. The Nucleus Pulposus of an intervertebral disc;
- is the major site of longitudinal fibers.
 - is composed of fibers arranged in an X pattern.
 - absorbs shock and equalizes stress.
 - surrounds the annulus fibrous.
34. All of these are characteristics of the lumbar spine except:
- large vertebral bodies.
 - spinous processes are almost horizontal.
 - lumbar spine is a primary curve.
 - adjoining superior and inferior facets, when viewed in the coronal plane, are parallel.
35. Spinal orthoses should be put on with the patient:
- standing.
 - supine.
 - prone.
 - sitting.
36. The paraspinal bars of a lumbosacral orthosis should:
- be as far apart as possible.
 - be as close together as possible.
 - have 1 ½ inches (36 mm) clearance between their medial edges.
 - follow the apices of the paraspinal muscles.
37. Lateral motion of the trunk occurs within which of the following planes?
- Sagittal
 - Coronal
 - Transverse
 - Median
38. The initials 'SOMI' stand for:
- Sternal Orthosis Mobility Immobilizer.
 - Sternal Occipital Mandibular Immobilizer.
 - Spinal Occipital Mandibular Immobilizer.
 - Superior Occipital Mandibular Immobilizer.
39. The recommended cervical orthosis for a moderate cervical muscle strain is a:
- HALO.
 - SOMI.
 - Two Poster Cervical Orthosis.
 - Philadelphia Collar.
40. The orthotic management of a T3 level fracture will have it's best 3 Point Pressure System via:
- TLSO: Sagittal/Coronal Control.
 - TLSO: Anterior Control.
 - Philadelphia collar.
 - Cervical Orthosis with thoracic extension.

41. Spastic paralysis may result from:
- a spinal cord injury.
 - a brain injury.
 - trauma to the cauda equina.
 - peripheral nerve injury.
 - 'a' and 'b'.
 - 'c' and 'd'.
42. For the assembly/pre-fitting of the TLSO: Anterior control, the overall length measurement of the device is calculated to be _____:
- decreased 3 inches (72 mm) from the patients length from the sternal notch to the pubis.
 - decreased 2 inches (48 mm) from the patients length from the sternal notch to the pubis.
 - increased by 1 inch (24 mm) from the patients length from the sternal notch to the pubis.
 - kept the same as the patients length from the sternal notch to the pubis.
43. Intra-abdominal pressure is used in spinal orthotics to:
- assist hyperextension of the thoracic spine.
 - eliminate motion.
 - prevent lumbar flexion.
 - reduce axial load on lumbar vertebrae.
44. If you use a TLSO: Sagittal control and found that the patient could not tolerate the strap pressure in the axilla, you might:
- pad the straps.
 - use a sternal plate.
 - loosen the straps.
 - 'a' and 'b'.
45. The insulation material which covers the fibers of some neurons is called:
- flial tissue.
 - neuroglia.
 - myelin.
 - arachnoid.
46. The motor neuron cell body is found in the:
- ventral horn.
 - sensory receptor.
 - cauda equina.
 - dorsal root ganglion.
47. The greatest amount of transverse motion occurs in the:
- cervical spine.
 - thoracic spine.
 - lumbar spine.
 - sacral spine.

48. All of these can be spinal pathologies/conditions except:
- Syphilis Neurotrophic Joint.
 - Colles fracture.
 - Hemangioma.
 - Hemivertebra.
49. The TLSO: Anterior Control is commonly recommended for:
- lateral wedging of vertebral bodies.
 - compression fracture of vertebral arches.
 - compression fracture of vertebral bodies.
 - fracture of spinous processes.
50. The TLSO: Anterior Control has two anterior pads that provide a posteriorly directed force. The anteriorly directed force by the posterior pad must be:
- equal to the combined effect of those pads.
 - greater than the combined effect of those pads.
 - less than the combined effect of those pads.
 - none of the above.
51. In the spine, most rotation occurs at which joint?
- Lumbosacral joint
 - Thoracolumbar joint
 - Atlanto-Occipital joint
 - Atlanto-Axial joint
52. Two adjacent vertebrae and their intervening tissue are known as:
- a Compartment.
 - a Block.
 - a Motion Segment.
 - a Coupling segment.
53. A 'Burst fracture' of the vertebral body is most likely associated with which mechanism of injury?
- Rotational forces
 - Extension
 - Shear forces
 - Axial load
54. A spinal orthosis can completely lock out motion within a spinal segment?
- True
 - False
55. Where does the majority of Axial rotation of the cervical spine occur?
- Between occiput and C1
 - Between C1 and C2
 - Between C3 and C4
 - Between C7 and T1.

56. Most sagittal motion (flexion/extension) of the cervical spine occur at which spinal segment?
- Between occiput and C1.
 - Between C1 and C2.
 - Between C3 and C4.
 - Between C7 and T1.

QUESTIONS 57-63: Below is a list of vertebral characteristics. Using the following key, determine the vertebral level described and circle the correct letter. There may be more than one answer per item.

C = Cervical

T = Thoracic

L = Lumbar

S = Sacral

- | | | | | |
|---|---|---|---|---|
| 57. Have costal articulations. | C | T | L | S |
| 58. Contains primary curves (normal, developing sagittal curves) | C | T | L | S |
| 59. Vertebrae are 7 in number. | C | T | L | S |
| 60. Facet orientation is nearly vertical in the sagittal plane thereby limiting lateral flexion and rotation. | C | T | L | S |
| 61. Contains secondary curves (normal, developing sagittal curves) | C | T | L | S |
| 62. Facet orientation is nearly vertical in the coronal plane thereby limiting flexion/extension. | C | T | L | S |
| 63. Facet orientation are mostly horizontal in the coronal plane thereby allowing flexion/extension, lateral bending and rotation. | C | T | L | S |

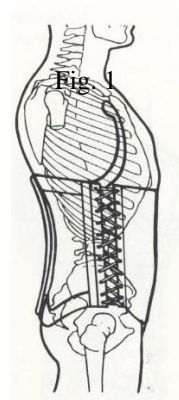
MATCHING: For each of the following anatomical landmarks/reference points in Column A match the corresponding vertebral level from Column B. There is only one answer for each numbered item. Each item from Column B may only be used once. (1 point each)

- | | | |
|---|-------|--------------------------------------|
| 64. Xiphoid Process | _____ | a. C ₁ |
| 65. Most prominent spinous process | _____ | b. C ₃ or C ₄ |
| 66. Level of the chin | _____ | c. C ₇ |
| 67. Just anterior of is the center of gravity | _____ | d. T ₁ or T ₂ |
| 68. Inferior angle of the scapula | _____ | e. T ₃ |
| 69. Natural waist | _____ | f. T ₇ or T ₈ |
| 70. Spine of the scapula | _____ | g. T ₉ or T ₁₀ |
| 71. Sternal notch | _____ | h. L ₃ |
| | | i. L ₄ |
| | | j. S ₂ |
| | | k. S ₄ & S ₅ |

SHORT ANSWER & FILL-INS:

Figures 1, 2 & 3 are different views of the same device. Utilize these 3 figures to answer questions 72-75.

72. What is the name of this device? (1 point)



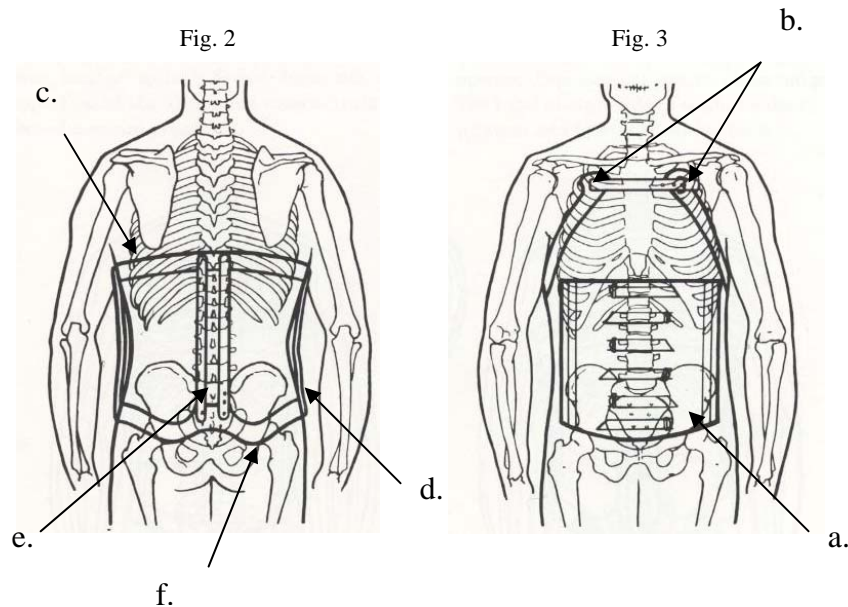
answer questions

73. For the device shown in Figure 1, please use 2 sets of arrows to indicate the Three Point Pressure systems utilized by this orthosis. Be sure that one set of arrows is indicated by solid lines and the second set is indicated with dashed lines.
(2 points)

74. In what plane(s) does this orthosis provide control? (1 point)

75. Name the lettered components.
(6 points)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____



76. Fill in the following Technical Analysis Form for a Jewett Orthosis. (4 points)

| | Flexion | Extension | Lateral Bending | Rotation |
|--------------|---------|-----------|-----------------|----------|
| Thoracic | | | | |
| Lumbar | | | | |
| Lumbo Sacral | | | | |

77. What is 'Wolff's Law'? (2 points)

78. In class there was listed 7 potential biomechanical principles that could be utilized in Spinal Orthoses. List 5 of those 7 here. (5 points)

79. A 56 year old man suffered a T₁₁ compression fracture after falling on a concrete floor from a standard desk chair. He stated he was standing on the chair, trying to reach something from the top of a filing cabinet. After one months time, the pain has subsided but the percent of compression increased from 50% to 75%. He was originally prescribed and fitted with a LS Corset (from another facility). He used this LS Corset only during the day for the first two weeks after his injury. He went to his orthopedist this morning for a follow-up exam where the films were taken and the change in status was observed. His weight is 230 lbs. and he is 5'8" tall.

A. What are some questions you would ask in the hopes of acquiring additional information?

B. What are your orthotic goals?

C. What then would be your orthotic recommendation and why? (5 points)

80. A 12 year old female presents to your office with her mother. The patient is in a powered wheelchair and slouched to the right. The mother explains that the girl has Spinal Muscular Atrophy. They come to your office after having a consultation with their orthopedist regarding potential future surgeries. They have a prescription that reads "Evaluate for spinal orthosis". Discussion with the patient reveals that she just wants to be able to stay in school so she can 'hang out' with her friends. The mother states that she has concerns about decreased breathing ability.

What are some questions you would ask in the hopes of acquiring additional information?

What are your orthotic goals?

What then would be your orthotic recommendation and why? (5 points)

CSUDH
LOWER EXTREMITY OX II
FINAL
Spring 2006

Name: _____

MULTIPLE CHOICE: Choose the one, best answer for each question. 1 point per question.

1. A complete lesion of the femoral nerve as it leaves the lumbar plexus affects:
 - a. ankle plantarflexion.
 - b. knee flexion.
 - c. knee extension.
 - d. hip extension.
 - e. hip adduction.
2. The major flexor of the hip is the:
 - a. rectus femoris.
 - b. sartorius.
 - c. iliopsoas.
 - d. gracilis.
3. Paralytic equines during swing phase is often caused by interruption of the:
 - a. saphenous nerve.
 - b. femoral nerve.
 - c. common peroneal nerve.
 - d. tibial nerve.
4. The hamstring muscles are:
 - a. innervated by the femoral nerve.
 - b. knee flexors and hip extensors.
 - c. hip flexors and knee extensors.
 - d. commonly called the 'tailor' muscles.
5. Orthoses are seldom necessary for patients with complete lesions at:
 - a. T₁₀.
 - b. T₁₂.
 - c. L₂.
 - d. L₅.
 - e. S₂.
6. What phase of gait is most susceptible to instability during normal human locomotion?
 - a. foot flat.
 - b. heel strike.
 - c. mid stance.
 - d. toe off.
 - e. swing.

7. Legg-Calve-Perthes' disease generally occurs in:
- adolescent males.
 - three to ten year old females.
 - adolescent females.
 - three to ten year old males.
8. Which of the following is a weight bearing surface in an Axial Resist AFO?
- Medial tibial flare.
 - Calcaneus.
 - Tibial tubercle.
 - Crest of the tibia.
9. For correction of genu valgum, forces should be applied over the:
- lateral condyle of the femur, lateral aspect of the foot and the head of the fibula.
 - thigh distal to the greater trochanter, lateral aspect of the foot and medial condyle of the femur.
 - anterior thigh, popliteal fossa and dorsal surface of the foot.
 - perineum, medial aspect of the foot and the lateral condyle of the femur.
 - medial condyle of the femur, medial aspect of the foot and the head of the tibia.
10. You are asked to recommend an orthosis for an infant with bilateral dislocated hips. The orthosis should hold the hips in:
- extension and internal rotation.
 - flexion and adduction.
 - extension and the knee in flexion.
 - flexion and abduction.
 - flexion and external rotation.
11. The goal in management of a flexible pathomechanical deformity is:
- correction.
 - accommodation.
 - reflexion.
 - deflexion.
12. Which of the following sequences best describes a '4-point' gait pattern?
- both crutches, one foot and then the other foot.
 - right crutch, left foot; left crutch, right foot.
 - right crutch and left foot simultaneously.
 - right crutch and right foot simultaneously; then left crutch and left foot simultaneously.
13. In relation to the greater trochanter, the anatomical hip joint is:
- 24 mm lateral and 12 mm distal.
 - 24 mm anterior and 12 mm proximal.
 - 24 mm proximal and 12 mm posterior.
 - 24 mm proximal and 12 mm anterior.
14. All of the following are true of the quadriceps muscles except:
- it is innervated by both the obturator and femoral nerves.
 - it is the chief extensor of the leg.
 - it inserts into the tibial tuberosity.
 - it consists of four parts, only one of which acts across the hip joint.

15. In a KAFO, recurvatum may be controlled by:
- raising the heel.
 - shallowing the distal thigh band.
 - using an offset knee joint.
 - all of the above.
 - none of the above.
16. A candidate for a Floor Reaction AFO must have:
- poor collateral ligaments.
 - coronal stability at the knee.
 - normal grade hip flexors/extensors.
 - all of the above.
 - none of the above.
17. A patient with a lower lumbar myelomeningocele may develop hip flexion contractures due to:
- lack of hip extensors to act as antagonists.
 - good knee control.
 - lack of dorsiflexors to act as antagonists.
 - all of the above.
 - none of the above.
18. Which of the following is not a principle of Fracture Orthoses?
- Noncompressibility of fluids.
 - Complete immobilization and fixation.
 - Maintenance of total contact.
 - Stimulation of bone healing through earlier ambulation.
19. The minimal clearance for a mechanical knee joint on a KAFO should be:
- 9mm medially and 8 mm laterally.
 - 5 mm medially and 6 mm laterally.
 - 8 mm laterally and 9 mm medially.
 - 6 mm medially and 3 mm laterally.
20. Which of the following is not an upper motor neuron lesion?
- Cerebrovascular accident.
 - Multiple sclerosis.
 - Cerebral palsy.
 - Guillain Barre syndrome.
21. When genu varum is present on a lower limb schema, the mid-sagittal line connects the perineum and the mark made:
- 30 mm medial to the knee.
 - 30 mm medial to the ankle.
 - 15 mm medial to the knee.
 - 15 mm medial to the ankle.

22. All of the following muscles are hip adductors except:
- adductor longus.
 - pectineus.
 - biceps femoris.
 - gracilis.
23. The schema for a metal KAFO should indicate the knee and ankle joint axes to be:
- parallel to the line of progression.
 - perpendicular to the mid sagittal line.
 - parallel to the mid sagittal line.
 - perpendicular to the line of progression.
24. A possible cause for circumduction during gait is:
- quadriceps weakness.
 - skeletal shortening.
 - hip flexor weakness.
 - all of the above.
 - none of the above.
25. You are asked to treat a patient with genu varum that cannot be corrected with moderate pressure. The orthosis should:
- be fabricated to conform to the limb and prevent further deformity.
 - unweight the limb.
 - create pressure on the medial aspect of the knee.
 - force the leg to neutral position after prolonged pressure.
26. When taking an impression for an Axial Resist AFO, the knee should be in 15° of flexion so the:
- Orthotist can more easily impress the limb.
 - bony prominences and patellar ligament are emphasized.
 - ankle can be more easily dorsiflexed.
 - patient is in most comfortable position.
27. The pelvic band on a HKAF0 should be located:
- superior to the anterior superior iliac spine.
 - across the greater trochanter anteriorly to the symphysis pubis.
 - midway between the iliac crest and the greater trochanter of the femur.
 - superior to the greater trochanter and posteriorly inferior to the distal tip of the coccyx.
 - between the anterior superior iliac spine and the crest of the ilium.
28. A HKAF0 with free hip motion in the sagittal plane is used primarily to allow:
- hyperextension and rotation.
 - flexion and extension.
 - pronation and supination.
 - abduction and adduction.
 - circumduction.
29. Femoral anteversion should be measured in which plane?
- Transverse.
 - Coronal.
 - Sagittal.
 - Frontal.

30. Spastic paralysis may result from:
- a. spinal cord injury.
 - b. brain injury.
 - c. poliomyelitis.
 - d. peripheral nerve injury.
 - e. 'a' and 'b'.
 - f. 'b' and 'c'.
 - g. 'c' and 'd'.
31. A '+' Trendelenburg sign is one caused by loss of the:
- a. gluteus medius.
 - b. biceps femoris.
 - c. gluteus maximus.
 - d. quadriceps.
32. Which of the following orthoses would not be used for Developmental Dysplasia of the Hip?
- a. Pavlik harness.
 - b. Von Rosen orthosis.
 - c. Ilfeld orthosis.
 - d. Newington orthosis.
33. In the transverse plane, the hip joint axis of an HKAFO is aligned:
- a. perpendicular to the knee axis.
 - b. parallel to the knee axis.
 - c. perpendicular to the ankle axis.
 - d. parallel to the ankle axis.
34. A posterior lean is most commonly seen in what type of gait paralysis?
- a. Combined quadriceps and hip extensor weakness.
 - b. Quadriceps weakness.
 - c. Hip extensor weakness.
 - d. All of the above.
 - e. None of the above.
35. A young boy with early signs of muscular dystrophy comes into your office. Since one of the first stages of this disease is weakness of the hip extensors, you would expect him to walk with:
- a. severe anterior lurch to keep his weight line anterior to the hip joint.
 - b. a KAFO to be adjusted for more stability.
 - c. high steppage gait.
 - d. lordosis as he attempts to align his weight posterior to the hip.
36. A Spina bifida child with meninges and spinal cord exposed is which type of myelomeningocele?
- a. Meningocele.
 - b. Myelocele.
 - c. Meningomyelocele.
 - d. Occulta.

37. Spina bifida child presents with L5 intact. The orthosis most indicated would be:
- HKAFOs.
 - KAFOs.
 - AFOs.
 - UCBLs.

38. A fusion of the talocalcaneal, talonavicular and calcanealcuboid is better known as a:
- Pantalar fusion.
 - Triple arthrodesis.
 - Liz Franc arthrodesis.
 - Charcot joint.

Questions 39 - 41 all pertain to the following scenario:

A one month old infant is seen, by you the Orthotist, in a hospital. In the chart notes the physician has left the following order:

DDH Orthotist to determine orthotic management. Call physician.

38. Which of the following tests would the physician most likely perform to confirm DDH?
- Adams flexion test.
 - Thomas test.
 - Ortolani test.
 - Eli test.
40. The orthosis of choice at this time would be:
- Pavlik harness.
 - Frejka pillow.
 - Newington orthosis.
 - Ilfeld orthosis.
41. When fitting the orthosis for DDH, which of the following fitting parameters is best indicated for this infant?
- 45° hip flexion and 45° hip abduction.
 - 90° hip flexion and 45° hip adduction.
 - 45° hip flexion and 90° hip abduction.
 - 90° hip flexion and 45° hip abduction.

Questions 42 – 45 all pertain to the following gait deviations. In analyzing gait, the following gait deviations can be observed. Determine which functional deficit is best associated with the gait deviations listed below. Choose only one answer; each option may only be used once.

A = Anterior Trunk Bending
P = Posterior Trunk Lean
S = Shortened Stride Length
V = Vaulting

- | | | | | |
|--|---|---|---|---|
| 42. Hip extensor weakness. | A | P | S | V |
| 43. Zero grade plantarflexors. | A | P | S | V |
| 44. Quadricep paralysis with weak gluteus maximus. | A | P | S | V |
| 45. Involved limb relatively longer. | A | P | S | V |

46. If the angle of inclination is decreased to 90° , _____ will result.
- genu vara
 - coxa valga
 - anteversion
 - coxa vara
47. All of the following are functions of a cushioned heel/rocker sole except:
- it simulates plantarflexion after heel strike.
 - it absorbs shock at heel strike.
 - it provides a smooth rollover through swing phase.
 - it reduces stress on the foot.
48. A child with Legg Perthes will have limitations in what ranges of motion?
- Hip internal rotation and abduction.
 - Hip internal rotation and flexion.
 - Knee flexion and hip abduction.
 - Hip external rotation and extension.
49. All of the following are true regarding Guillain Barre except:
- it is lower motor neuron paralysis.
 - it is almost always symmetrical in presentation of deficits.
 - complete recovery is uncommon.
 - it is an acute idiopathic polyneuritis.
50. An individual who requires assistance with a cane for ambulation should use the cane in their _____ hand.
- dominant
 - contralateral
 - ipsilateral
 - weaker

Questions 51 – 59 for the description of hip placement/anatomical presentation on the left, match the definition from the column at the right. Each letter will only be used once.

- | | | |
|--------------------------|-------|---|
| 51. Angle of inclination | _____ | a. Reduces abductor lever arm |
| 52. Coxa valga | _____ | b. Reduced & stable when hip is flexed & abducted |
| 53. Retroversion | _____ | c. Tends to increase hip joint stability |
| 54. Anteversion | _____ | d. Clinically presents as 'in-toeing' |
| 55. Dislocation | _____ | e. Abnormal development of acetabulum |
| 56. Coxa vara | _____ | f. Normal angle value is 125° |
| 57. Subluxation | _____ | g. Normal angle value is 15° |
| 58. Acetabular dysplasia | _____ | h. Femoral head completely outside of acetabulum |
| 59. Angle of Torsion | _____ | i. Clinically presents as 'out-toeing' |

60. On a KAFO used to prevent knee flexion, which components are responsible for the anteriorly directed forces?
- infrapatellar strap and calf band.
 - calf band and distal thigh band.
 - proximal thigh cuff and popliteal strap.
 - proximal thigh band and shoe counter.
 - anterior calf closure and suprapatellar strap.
61. On a KAFO used to prevent knee recurvatum, two of the necessary components are:
- infrapatellar strap and pre-tibial shell.
 - calf band and distal thigh band.
 - proximal thigh cuff and popliteal strap.
 - proximal thigh band and shoe counter.
 - anterior calf closure and suprapatellar strap.
62. A primary advantage of a bale lock knee joint on a KAFO is:
- to eliminate the rattle of the drop lock.
 - to provide structural separation of the knee joints during stance phase.
 - to facilitate operation of the lock when there is upper limb impairment.
 - to accommodate up to 10° flexion contracture of the knee.
63. The advantage of a posterior offset, free motion knee joint versus a standard free motion knee joint is:
- extension moment during stance phase.
 - flexion moment during swing phase.
 - extension moment during swing phase.
 - flexion moment during stance phase.
64. An orthotic system used for Spina bifida patients (level L2) to allow them to begin to stand upright is the:
- Bilateral KAFOs.
 - Hip abduction orthosis.
 - Parapodium.
 - RGO.
65. A 20 year old female, post polio, is seen in clinic. Upon evaluation it was determined the she had weakness at her left hip, knee and ankle. She also has a 10° knee flexion contracture. Which of the following orthoses do you recommend?
- Free ankle motion AFO
 - KO with valgum control.
 - KAFO with knee flexion assist and free ankle.
 - KAFO with knee flexion restraint and ankle control.
66. The following patient is seen in clinic: 62 year old male with 45° genu valgum of the left knee. The valgum can be corrected down to 20°. He also displays 15-20° of genu recurvatum. He has weak muscles throughout his left lower leg (all muscles are 2 or less). Which of the following orthoses do you suggest? Pick only one.
- KAFO with plastic tibial component to control recurvatum & valgum
 - KAFO with 4 buckle knee pads.
 - Solid AFO set in 2-3° dorsiflexion.
 - KAFO with limited range of motion adjustments.

67. The side bars of a KAFO should lie _____ to the leg in the sagittal plane.
- anterior to midline
 - posterior to midline
 - at midline
 - Any or all of the above
 - None of the above
68. According to the article by Lehman, which of the following was not an acceptable knee control design ?
- Patellar Tendon Strap
 - Supra-patellar Strap
 - Knee cap strap
 - Combo Patellar Tendon & Supra-patellar strap
69. A true neuropathy produces a loss of sensation which is equidistant from the spine in both legs and arms.
- True
 - False
70. In reality, a post-op hip abduction orthosis used after a total hip arthroplasty functions primarily as a kinesthetic reminder.
- True
 - False

Questions 71 – 76 pertain to the lecture regarding hip range of motion. For the action listed in the left column, match the appropriate amount of normal range motion available for that action. Each option may be used once, twice or not at all. (1 point each)

- | | | |
|-----------------------|-------|--------------------------------------|
| 71. Adduction | _____ | a. 45° |
| 72. Abduction | _____ | b. 120-135° (with the knee extended) |
| 73. Flexion | _____ | c. 120-135° (with the knee flexed) |
| 74. Extension | _____ | d. 10-30° |
| 75. Internal Rotation | _____ | e. 30-50° |
| 76. External Rotation | _____ | |

EXTRA CREDIT

A patient has bilateral lower extremity paralysis and uses a wheelchair as their primary means of ambulation. The patient also has poor trunk control. During which of the following activities should an attendant always position the wheelchair backwards? (1 point)

- Ascending stairs.
- Ascending a steep incline.
- Descending stairs.
- None of the above

Important pre-fitting criteria for a plastic KAFO include checking for: (1 point)

- skin tightness and trim lines.
- joint alignment and imperfections in the plastic.
- Appropriate trim lines and areas of impingement.
- fit in the shoe and impingement of the malleoli.

SHORT ANSWER

1. What are 3 contra-indications for using a RGO system and why, biomechanically? (3 points)

2. What clinical picture would you expect to see in injuries to each of the following nerves? (6 points)
Common Peroneal, just above the knee

L2, complete

L5, complete

3. In class we discussed 6 indications for using a KAFO instead of an AFO. Name 4. (4 points)

4. For the following gait deviations, describe: 1) the phase of gait in which occurs; 2) how to observe the deviation; and 3) a brief description of causes of the deviation. (12 points)

Circumduction:

Lateral Trunk Bending

Excessive Medial Foot Contact

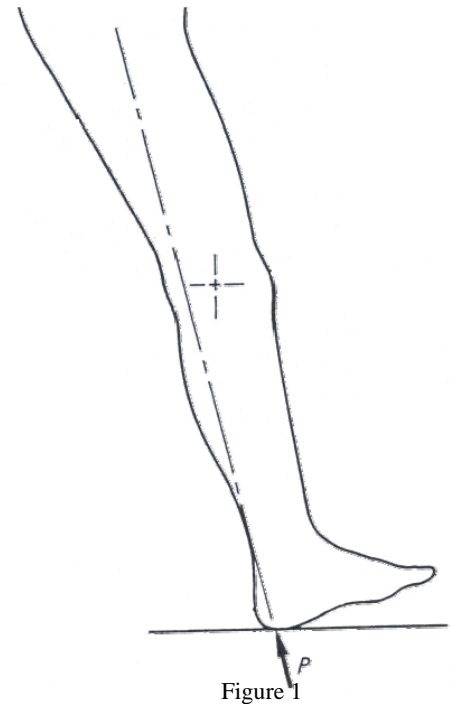
Lordosis

5. A 10 year old boy has multiple problems resulting from a gunshot wound to the spinal cord two years ago. His involvement is with the right leg. Significant findings include:

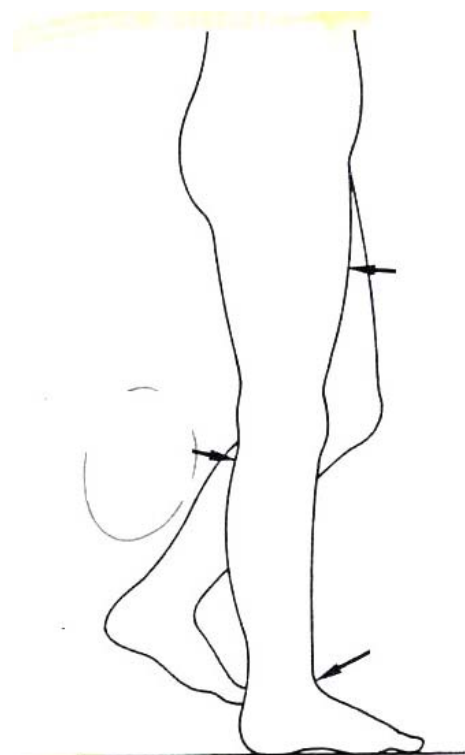
- Upon weight bearing, there is medial and lateral instability at the knee as well as 15° recurvatum.
- There is an excessive amount of ankle valgus and the patient is unable to actively bring his foot into an inverted range.
- He is able to actively dorsiflex his ankle to neutral but with 'fair' graded strength.
- Mild clonus can be initiated in the plantarflexors.
- With continuous weight bearing, the medial longitudinal arch collapses.
- Hip strength, range of motion and volitional are all within normal limits.

With the information presented, what are your Orthotic goals? What would your Orthotic recommendation be and why? (8 points)

6. Referring to Figure 1, draw in the necessary Three Point Pressure System provided by a KAFO to address weak quadriceps. At what phase(s) of gait are weak quads particularly problematic and why? What would be your choice of knee & ankle componentry for this scenario and why biomechanically? Would you change any of your components if the patient was bilaterally involved? (5 points)



7. Referring to Figure 2, draw in the necessary Three Point Pressure System provided by a KAFO to address knee recurvatum. What would be your choice of knee & ankle componentry for this scenario and why? Would you change any of your components if the patient was bilaterally involved? (3 points)



BELOW KNEE PROSTHETICS
Below Knee & Symes Prosthetics Final Examination
Fall 2006

Name: _____

Multiple Choice: choose the one, best answer.

1. Which of the following is a complication of diabetes which may lead to an amputation:
 - a. Small vessel disease.
 - b. Susceptibility to infection.
 - c. Diabetic Peripheral Neuropathy.
 - d. Atheroma (blockage of major arteries).
 - e. All of above
2. Nearly _____ percent of all lower extremity amputations are due to Ischemic Vascular Disease.
 - a. 80%
 - b. 60%
 - c. 50%
 - d. 40%
3. A specific disease leading to amputation which occurs most often among male smokers between the ages of 30 and 50 is:
 - a. Diabetes Mellitus.
 - b. Tarsal tunnel syndrome.
 - c. Buerger's disease.
 - d. Osteomyelitis.
4. A major goal in children with lower extremity amputation is:
 - a. preservation of the epiphyses.
 - b. encouragement of bony overgrowth.
 - c. prevention of verrucous hyperplasia.
 - d. preservation of exotosis.
5. Pressure applied by a BK prosthetic socket, if correctly and evenly distributed, should not affect the major artery supplying blood to the trans-tibial amputation. Name the artery.
 - a. Anterior tibial
 - b. Popliteal
 - c. Lateral plantar
 - d. Posterior tibial
6. Which of the following is not a technique in making the vascular decision in determining the level of lower extremity amputation?
 - a. Doppler pressure measurements.
 - b. Blood glucose level.
 - c. Segmental blood pressure.
 - d. Skin blood flow measured by Xenon clearance.

7. The immediate post-op rigid dressing:
 - a. allows knee flexion for early mobility.
 - b. reduces edema and pain.
 - c. provides easy access to the wound.
 - d. allows full weight bearing.
 - e. mobilizes the knee joint to prevent flexion contracture
8. The first cast change in the IPPF generally occurs:
 - a. in 2-3 days.
 - b. in 7-10 days.
 - c. when the sutures are removed.
 - d. when the patient attains full weight bearing on the IPPF.
9. An advantage of a soft dressing and an elastic stump shrinker used postoperatively is:
 - a. it provides protection of the wound from direct impact.
 - b. it provides excellent control of edema.
 - c. it is difficult to apply and remove.
 - d. allows knee flexion.
10. To find and mark the Medial Tibial Plateau, direct the patient to:
 - a. straighten the knee.
 - b. flex the knee to 60 degrees.
 - c. flex the knee to 90 degrees and internally rotate the knee.
 - d. flex the knee to 90 degrees and externally rotate the knee.
11. When making the medial template for PTB mold modification, how much is usually trimmed away to plan for plaster removal in the tibial flare area?
 - a. 0"
 - b. 1/8" – 3/16"
 - c. 1/4" – 5/16"
 - d. 1/2"
12. After taking the ML and PML measurements for a PTB SC/SP socket, what additional measurement is made that is not recorded for the standard PTB?
 - a. Circumference at mid patella.
 - b. Circumference at MTP level.
 - c. Mid patella to PML distance.
 - d. MTP to PML distance.
13. The deepest part of the PTB popliteal modification should be:
 - a. walnut shaped.
 - b. smooth and gradual, with deepest part at the A-P dimension level.
 - c. flat, with the deepest part at 10 degrees below A-P dimension level.
 - d. smooth and gradual, with deepest part at level of posterior trim line.
14. Upon fitting the PTB socket with a pelite liner, the length is correct, but the amputee reports excessive pain at the distal end. One possible solution is to:
 - a. add a pad to lateral shaft of fibula.
 - b. add a pad to medial tibial flare.
 - c. add a pad to medial femoral condyle.
 - d. add a pad to anterior distal tibia.

15. On a standard PTB prosthesis, the medial and lateral trim lines are never lowered:
 - a. more distal than mid-patella.
 - b. more distal than the femoral condyles at the level of the adductor tubercle.
 - c. more distal than 2 ½" proximal to MTP.
 - d. more distal than 2 ¼" proximal to MTP.
16. The Patella Tendon bearing Supra Condylar - Supra Patella (PTB SCSP) design is indicated for all of the following except:
 - a. short residual limbs.
 - b. mild medio-lateral instability.
 - c. patients with popliteal scarring.
 - d. obese or muscular patients without sufficient purchase above the femoral condyles.
17. An anterior plumb line drawn on the outside of the PTB mold will help establish:
 - a. socket flexion-extension.
 - b. socket adduction-abduction.
 - c. prosthesis length.
 - d. All of the above
18. The keel of the SACH foot replaces the function of which of the following muscle groups?
 - a. Hamstrings
 - b. Plantar Flexors
 - c. Dorsiflexors
 - d. Toe extensors
19. Proper initial toe out of the prosthetic foot is reached when:
 - a. the medial border of the foot is parallel to the line of progression.
 - b. the midline of the foot is parallel to the line of progression.
 - c. the long axis of the foot is 3-5° or 5-7° out from the line of progression
 - d. 'a' & 'c'
20. What auxiliary suspension may be added to a PTB Cuff Strap when constriction above the knee is a concern?
 - a. Side joints and thigh lacer.
 - b. Supracondylar Wedge.
 - c. SC/SP Suspension.
 - d. Waist belt.
21. Which of the following PTB gait deviations would be present if the amputee was "hill climbing"?
 - a. Excessive pistoning.
 - b. Excessive heel lever.
 - c. Excessive toe lever.
 - d. Excessive lateral thrust.
22. Which of the following PTB gait deviations would be present if the socket was too far anterior in relation to the foot?
 - a. Foot slap.
 - b. Excessive dorsiflexion.
 - c. Drop off.
 - d. Excessive lateral thrust.

23. Which of the following does not provide knee extension control?
- Neoprene sleeve suspension.
 - Side Joints and Lacer.
 - PTB SC/SP.
 - Supracondylar cuff.
24. In dynamic alignment, when the Berkeley pylon leans laterally; the correction is to:
- adduct the socket and inset the foot.
 - flex the socket and slide the foot forward.
 - adduct the socket and outset the foot.
 - abduct the socket.
25. What is the cause of lateral trunk bending in excess of 1" during mid-stance?
- Prosthesis too long.
 - Prosthetic foot outset too far laterally.
 - Faulty suspension.
 - Too much socket adduction.
26. If the amputee walks through heel contact on an extended knee, what is the problem?
- Short heel lever arm.
 - Heel cushion too soft.
 - Patient is an old side-joint and thigh lacer wearer.
 - Could be any of the above.
27. The amputee complains of pain or excessive pressure on the anterior distal aspect of their residual limb and spends an excessive period of time on the heel of the foot during stance phase. Which of the following would best solve the problem?
- Move the socket anterior.
 - Extend the socket.
 - Stiffen the heel cushion.
 - Flex the socket.
28. Which of the following gait deviations would likely be evident if there was too short a keel on the SACH foot?
- Excessive pistoning.
 - Excessive lateral thrust.
 - Drop off at the end of stance phase.
 - Insufficient knee flexion.
29. The ML measurement of the BK amputee is taken on the apex of the:
- Greater trochanter.
 - Femoral condyles.
 - Tibial condyles.
 - Acetabulum.
30. When the Berkeley pylon is leaning medially during dynamic alignment, the correction is to:
- adduct the socket and outset the foot.
 - flex the socket and inset the foot.
 - inset the foot and extend the socket.
 - abduct the socket and inset the foot.

31. Piston action of the BK PTB prosthesis is a result of :
- Excessive knee flexion.
 - Loose socket fit.
 - Inadequate suspension.
 - Poor alignment.
32. What is the effect of shortening the heel lever arm of the prosthetic foot on the PTB prosthesis at heel strike?
- Increases the force that tends to extend the knee.
 - Increases the force that tends to flex the knee.
 - Decreases the force that tends to cause a varus moment.
 - Decreases the force that tends to extend the knee.
33. What is the effect of moving the socket forward over the foot?
- Decreases the amount of socket flexion.
 - Reduces length of anterior lever arm of the foot.
 - Increases amount of socket flexion.
 - Increases length of anterior lever arm of the foot.
34. When properly fitted, the cuff suspension will:
- maintain the knee in flexion at heel strike.
 - tighten when sitting.
 - loosen when standing.
 - prevent excessive knee flexion at heel strike.
35. In dynamic alignment, if the knee is forced forward and knee flexion is exaggerated at heel contact, it indicates:
- the socket is positioned too far posterior.
 - excessive extension of the socket.
 - the socket is positioned too far anterior.
 - the heel is too soft.
36. If the residual limb is quite short, it may be necessary in dynamic alignment to cut down the medial - proximal and lateral - distal forces on the residuum by:
- moving foot posteriorly.
 - moving foot laterally.
 - moving foot medially.
 - moving foot anteriorly.
37. In checking out a PTB prosthesis, the amputee should be able to flex his knee on the amputated side at least _____ for comfortable sitting.
- 65 degrees
 - 90 degrees
 - 110 degrees
 - 130 degrees

38. At the time of heel contact, and until the foot is flat on the floor, the PTB prosthesis wearer should:
- hyperextend the knee.
 - quickly flex the knee.
 - quickly extend the knee.
 - maintain controlled knee flexion.
39. The anterior-lateral surface of the BK limb is pressure tolerant. The soft tissue structures which serve to "cushion" the anterior-lateral aspect of the limb include all except:
- the anterior tibialis.
 - the extensor digitorum brevis.
 - the extensor hallucis longus.
 - the flexor digitorum longus.
40. What muscle group acts to decelerate the leg and stabilize the knee before heel strike?
- Pretibials.
 - Hamstrings.
 - Quadriceps.
 - Adductors.
41. If a Trans Tibial Amputee weighed more than 300 pounds, what alignment change would be expected?
- More foot inset
 - Flex the socket more
 - Extend the socket more
 - Less foot inset
42. The heel wedge (or plantar flexion bumper) of a prosthetic foot simulates to some degree the function of the:
- Tibialis anterior.
 - Quadriceps.
 - Gastrocnemius.
 - The long toe flexors.
43. A reason a narrow based gait is desirable for a Trans Tibial amputee is because:
- the varus moment is decreased.
 - the foot remains flat on the floor.
 - less energy is consumed.
 - the knee flexes at heel strike.
44. When taking a cast for a PTB socket, as the plaster wrap begins to harden, the prosthetist must:
- put water on the plaster to prevent heat from blistering the residual limb.
 - flex the amputee's knee to 45°.
 - use the ends of his thumbs and fingers to outline the patella tendon and flatten the popliteal tissues.
 - compress the distal end of the residual limb with one hand while pressing down on the knee with the other hand.

45. When the heel of a PTB wearer's prosthesis strikes the floor, how many degrees should his knee be flexed:
- 5 -10 degrees.
 - 12 -15 degrees.
 - 20 - 30 degrees.
 - 25 - 30 degrees.
46. In BK dynamic alignment, if the knee is forced forward and knee flexion is exaggerated at heel contact, it indicates:
- heel lever arm too short.
 - heel cushion on SACH foot too soft.
 - heel lever arm too long.
 - toe lever too long.
47. In "check out" of the unilateral PTB prosthesis, the amputee base of gait should not be wider than:
- 1".
 - 1 1/2".
 - 2".
 - 3".
48. In dynamic alignment of the BK prosthesis, lateral displacement of the socket exceeds 1/2". Why?
- Prosthetic foot excessively outset.
 - Prosthetic foot aligned with 0" inset.
 - Prosthetic foot excessively inset.
 - Socket flexed excessively.
49. The major weight-bearing areas on a PTB type Trans Tibial limb are:
- distal ends of tibia and fibula.
 - patellar tendon and medial flare of the tibia.
 - hamstring tendons and head of fibula.
 - fleshy pads of the quadriceps muscles.
50. Side joints and thigh lacers are most commonly needed on the PTB BK prosthesis when worn by an amputee:
- who has an AK-BK bilateral.
 - who has a BK-BK bilateral.
 - who has a very short residual limb.
 - who is over age 60.
51. The anatomical landmark which may require relief along the lateral proximal brim of the PTB SC/SP is the:
- Lateral tibial condyle.
 - Adductor tubercle.
 - Tensor fascia latae.
 - Fibular head.

52. The total contact TSB prosthesis is an aid to the patient with vascular problems because:
- it reduces excessive blood flow to the residual limb.
 - it prevents sensitive skin pain.
 - it can help stimulate circulation without excess proximal constriction.
 - it could constrict circulation proximally.
53. When doing a two stage casting technique, it is important to mold the anterior panel very carefully because it will:
- provide critical support for the rest of the mold.
 - be more comfortable for the patient when you remove it.
 - provide a nice cosmetic appearance on the anterior of the finished limb.
 - record the weight bearing areas of the patellar tendon, tibia and medial tibial flare.
54. The essence of the TSB BK Prosthesis is:
- the advent of precision casting techniques.
 - the routine use of transparent diagnostic sockets.
 - a marked departure from the PTB modification procedure.
 - All of the above.
55. In order to distribute pressure over the greatest surface area on the TSB BK positive model:
- plaster is removed along weight tolerant areas and added to weight sensitive areas.
 - plaster is added to weight tolerant areas and removed from weight sensitive areas.
 - plaster is removed from weight tolerant areas and no plaster is added to the model to relieve sensitive areas.
 - plaster is added to the bony prominences.
56. To achieve a three ply fit in the TSB BK socket, you modify circumferences to what measurement?
- $\frac{1}{2}$ " - $\frac{3}{4}$ " inch under measured circumference.
 - $\frac{1}{4}$ " - $\frac{3}{8}$ " under measured circumference.
 - Exactly to residual limb measurements.
 - $\frac{1}{2}$ inch over measured circumference.
57. The shape of the patellar tendon in the TSB BK socket is quite similar to the PTB "bar".
- True
 - False
58. The hamstring relief on the posterior aspect of the socket is typically seen with the:
- lateral relief being level with the medial relief.
 - medial relief being $\frac{1}{2}$ - $\frac{3}{8}$ inch lower than the lateral relief.
 - medial relief being $\frac{1}{8}$ inch higher than the lateral relief.
 - lateral relief being 1 inch higher than the medial relief.
59. What is an advantage of a Symes amputation?
- Bulbous end is more cosmetic.
 - Enables prosthetist to make a stronger socket.
 - End bearing capabilities.
 - Ability to fit most types of Dynamic Feet.

60. What is the inherent disadvantage in most common Symes alignment procedures?
- Lack of flexion-extension.
 - Lack of adduction-abduction.
 - Lack of A - P slide.
 - Lack of rotation.
61. The Canadian Symes Prosthesis is designated by:
- no window.
 - a medial window.
 - a stovepipe configuration.
 - an elastic sleeve.
62. The second stage of the two stage Symes amputation requires the removal of the:
- Malleoli.
 - Heel pad.
 - Calcaneous.
 - Talus.
63. The Symes amputee is typically more active, walks at a faster pace, and expends more energy than the Below Knee amputee.
- True
 - False
64. Amputation of the forefoot at the tarsal-metatarsal joints is called a:
- Symes amputation.
 - Lisfranc amputation.
 - Chopart amputation.
 - Transmetatarsal amputation.
65. One of the inherent problems with more proximal levels of partial foot amputations is:
- knee flexion contractures.
 - dorsiflexion contractures.
 - equinovarus deformity.
 - equinovalgus deformity.
66. An amputee is viewed ambulating from the sagittal plane and very little compression occurs in the SACH heel at heel strike. The patient experiences drop off at the end of stance phase. The likely solution is to:
- move socket anterior.
 - move socket posterior.
 - flex the socket.
 - adduct the socket.
67. Why is a stiffer heel wedge used in BK as opposed to AK?
- Lengthen toe lever.
 - Optimize suspension position.
 - Keep foot flat on floor.
 - Encourage knee flexion.

68. As the foot on a BK prosthesis is moved further medially or inset, the varus moment...
- is decreased.
 - is increased.
 - does not change.
 - becomes a valgus moment.
69. Which of the following is a characteristic of a SACH foot?
- Articulated ankle joint.
 - Soft plantar-flexion bumper.
 - Wedge cushioning in heel.
 - Firm rubber dorsiflexion stop.
70. What type of movement is permitted by the multiple-axis foot-ankle assembly?
- Plantar flexion
 - Inversion
 - Eversion
 - All of the above
71. An classic advantage of a modular endoskeletal system is:
- interchangeability of components.
 - reduction of components.
 - increased delivery time.
 - complication of training.
72. To begin bench alignment, all slide and tilt adjustments of the BK Alignment Jig should be at:
- mid range; also known as at "zero".
 - 10 degrees-12 degrees anterior tilt, 5 degrees lateral tilt.
 - 5 degrees tilt, anterior tilt determined by cast.
 - 1-1/2" posterior, 1/2" inset of the foot.
73. What relative amount of time is spent in the stance phase of the gait cycle?
- 75 %
 - 60 %
 - 40 %
 - 25 %
74. In normal human locomotion, the highest point the center of gravity achieves is when the:
- supporting limb is in the middle of stance phase.
 - supporting limb is at the end of stance phase.
 - supporting limb is at the beginning of swing.
 - body is in the state of double support.
75. In normal human locomotion, what is the range (in inches) of medial-lateral movement of the center of gravity?
- Five.
 - Four.
 - Three.
 - Two.

76. In analyzing the motion of the ankle joint during the gait cycle, the joint has gone from a neutral position to 15° of plantar flexion between:
- mid stance and toe off.
 - heel strike and foot flat.
 - mid swing and heel strike.
 - foot flat and mid stance.
77. Inset of the prosthetic foot tends to increase pressures on the _____ aspects of the limb at mid-stance.
- medial-proximal and lateral-distal
 - medial-distal and lateral-proximal
 - medial-proximal and medial-distal
 - lateral-proximal and lateral-distal
78. When fitting the silicone suction liner, the prosthetist must check the proximal edges to insure they are smooth, because silicone:
- has a high modulus of elasticity.
 - has a high yield point.
 - is very notch sensitive.
 - has high tensile strength.
79. The correct size of an Ossur silicone liner is determined by measuring the diameter of the residual limb:
- 2cm from distal end.
 - 4cm from distal end.
 - 8cm from distal end.
 - 10cm from distal end.
80. A Trans Tibial patient measures 29 cm in circumference approximately 1 ½ inches from the distal end of the residual limb. The proper size pin-style liner to try first is:
- 27 cm
 - 28 cm
 - 30 cm
 - 31 cm
81. The downward movement of the skeleton would be prevented by the incompressable nature of the residual limb tissues whose volume is contained within a rigid socket; thus the socket shape is designed according to the concept of :
- hydrostatic fitting.
 - skeletal fitting.
 - Radcliffe and Foort.
 - PTB.
82. For a Total Surface Bearing design Transtibial prosthesis, you should bring the AP on the positive model cast to AP plus:
- 0".
 - 1/4" – 3/8" over
 - 1/2" – 5-8" over
 - 1"over

83. For a Radcliffe design PTB prosthesis, when you modify the popliteal area to bring the AP to the desired measurement for a socket with a pelite liner, the cast measurement equals 'anatomical AP' plus:
- 1/8".
 - 1/4".
 - 1/2".
 - 1".
84. The finished ML dimension of a PTB or TSB socket to be fit with a pelite liner should be the 'anatomical ML:
- up to + 1/2".
 - minus 1/4".
 - up to + 1/8".
 - minus 1/8".
85. During the Swing Phase of Normal Human Locomotion, the Quadriceps function to:
- accelerate the limb after Toe Off.
 - prevent too much knee flexion.
 - flex the knee.
 - decelerate the limb prior to Heel Strike.
86. An amputee using Side Joints and Thigh Lacer on their prosthesis is seated. The posterior brim of the socket should be _____MTP.
- one inch distal to
 - one-half inch proximal to
 - one inch proximal to
 - at the same level as
87. The suprapatellar portion of the PTB SC-SP socket functions to:
- assist in the suspension of the prosthesis.
 - allow undesirable hyperextension of the knee.
 - increase ML stability.
 - 'a' and 'b'.
88. The Trans Tibial amputee complains of pain on the distal lateral area of their residual limb during ambulation. Which of the following is a possible cause?
- Inadequate contour of the Medial Tibial Plateau.
 - The foot is too far outset.
 - The socket AP dimension is too large.
 - There is an excessive varus moment at the knee.

True/False

89. Conservation of residual limb length in an amputation is a basic principle of modern amputation surgery.
- True.
 - False.
90. Approximately 10% of all lower extremity amputations are the result of congenital limb deficiencies.
- True
 - False

91. 33% of patients who lose a limb to Ischemic Disease can expect to lose the opposite limb within 5 years (if living).
a. True
b. False
92. A soft liner or silicone gel liner is almost always prescribed for the patient with Diabetes or PVD.
a. True
b. False
93. A posterior leaning pylon during static alignment may be caused by too soft a heel cushion of the SACH foot.
a. True
b. False
94. An anterior leaning pylon during static alignment may be caused by insufficient heel height on the prosthetic foot compared to the shoe being used.
a. True
b. False
95. The PTB SC with removable medial wedge has the most effective extension stop compared to the side joint and lacer design.
a. True
b. False
96. Cuff suspension of the PTB ideally maintains tightness over the patella in a 30 degree range of motion from sitting to standing.
a. True
b. False
97. The fish mouth closure is the best configuration for Below Knee amputation.
a. True
b. False
98. The typical timing for fitting a child for their first transtibial prosthesis is:
a) 4-6 months – rolling over
b) at 6-8 months – sitting up
c) at 12-13 months – pulling up to stand
d) at 2-3 years – toddler
99. The standard coronal alignment for fitting a child with a transtibial prosthesis is:
a) 1" AP socket position
b) in abduction
c) in adduction
d) ½" ML foot position
100. Skin redness in the clear diagnostic socket is indicative of insufficient pressure.
a. True
b. False

Short Answer/Essay

1. (3 points) Name three things you might consider doing differently in regards to alignment or components for a bilateral BK amputee compared to a unilateral amputee.
2. (1 point) At what point in the gait cycle would you expect the patient to exert the greatest forces on the anterior distal aspect of the tibia?
3. (1 point) The BK socket exhibits a large varus movement no matter how far outset you place the foot (the pylon is vertical). Name the possible prosthetic cause for this deviation.
4. (1 point) During dynamic alignment, the ball of the foot is 2" above the floor at heel contact, and at midstance to toe off the socket drops off. Name one alignment change to improve both conditions.
5. (2 points) The patient complains of anterior distal pain no matter what adjustment you make to flexion or extension. The anatomical AP is 3 3/8" and the socket AP is 3 1/2". Name 2 prosthetic reasons that could cause this pain.
6. The BK prosthesis with cuff suspension is pistoning no matter what adjustments are made to the strap tightness and tab placement. Name four alternative suspension solutions. (2 pts)

7. Name two possible socket and suspension types for a person with a 2 1/2" length mature BK residual limb: (2 pts)

8. (6 points) The local VA physician has referred a new military amputee to you for fitting. He had an Ertl procedure secondary to trauma from an IED (improvised explosive device), 9" tibia length, 18 1/2" MTP, age 25, no contractures, skin is clear of scars or adhesions, active, 165 lbs, K3-4 activity level.

Concisely describe an Ertl Procedure:

Provide a complete recommendation with justifications for all componentry.

Recommendation:

Justification

Socket

Suspension

Interface

Foot

Alignment &
special considerations:

9. (5 points) The surgeon is asking for your professional prosthetic recommendation for an 82 year old male who underwent a left Trans Tibial amputation 6 months ago secondary to PVD complications. There were post-op complications of delayed healing. The patient had been treated with a series of soft dressings and ace bandages up to this point, and has now completely healed, with proximal circumference greater than distal circumference. The residual limb is 4" in length with a 15° knee flexion contracture. The surgeon adds that the patient has moderate rheumatoid arthritis that affects his hand dexterity. You inquire about the patient's functional level and the surgeon states that the patient is retired, lives alone in a second floor apartment in a retirement community and wants to return to walking 1-2 miles daily.

Provide a complete recommendation with justifications for all componentry.

Recommendation:

Justification

Socket

Suspension

Interface

Foot and K-level:

Alignment &
special considerations:

updated 10/06

FINAL EXAM

Above Knee Prosthetics

SPRING 2006

Name: _____

1. The maximum amount of pelvic tilt in normal locomotion occurs in:
 - a. Heel strike.
 - b. Toe – off.
 - c. Deceleration.
 - d. Mid – stance.
2. Which of the following muscles is not among the adductor group:
 - a. Adductor longus.
 - b. Adductor Magnus.
 - c. Gracilis.
 - d. Sartorius.
3. The knee bolt of the prosthesis is usually found to be:
 - a. perpendicular to the line of progression.
 - b. in approximately 5 degrees internal rotation relative to LOP
 - c. in approximately 5 degrees external rotation relative to LOP
 - d. in approximately 8 degrees external rotation relative to LOP
4. When the above knee amputee must arch his back to maintain the center of gravity of his body in the proper position while pressing back with his residual limb, it is an indication that the:
 - a. amputee has a pronounced lumbar lordosis.
 - b. foot on the prosthesis is located too far laterally.
 - c. residual limb was fit into a socket without adequate initial flexion.
 - d. residual limb was fit into a socket with excessive abduction.
5. A medial whip in the AK prosthesis is caused by:
 - a. improper placement of the toe-break.
 - b. external rotation of ankle axis.
 - c. medial rotation of ankle axis.
 - d. excessive external rotation of knee bolt.
6. During dynamic alignment, the Trans Femoral patient is walking on the lateral border of their prosthetic foot. The Prosthetist should:
 - a. Abduct the socket
 - b. Adduct the socket
 - c. Flex the socket
 - d. Extend the socket
7. When pulling the amputee into a AK socket, the two most important land marks are the:
 - a. Gluteus maximus muscle, Rectus Femoris channel
 - b. Hamstring muscle group, Trochanter
 - c. Adductor longus tendon, Ischial Tuberosity
 - d. Rectus femoris muscle, Hamstring Channel

8. Which of the following causes of lateral trunk bending is prosthetic caused?
 - a. Weak abductors
 - b. Foot outset too far
 - c. Hip pathology
 - d. Foot inset too much
9. How does an excessively stiff heel lever in the prosthetic foot affect knee stability?
 - a. Causes a knee extension moment.
 - b. Has no affect on knee stability.
 - c. Causes a knee flexion moment.
 - d. Makes it necessary to move the socket posterior in relation to the knee bolt.
10. At push-off, it is common for an AK amputee with well developed hamstring muscles to force himself off the ischial seat as his residuum extends. How can this trouble be avoided?
 - a. Align the socket so the extensor muscles are elongated slightly
 - b. Align the socket in a position of initial flexion
 - c. Align the socket in a position of initial extension
 - d. Align the socket so the abductor muscles are elongated slightly
11. If the AK amputee complains of pressure on the pubic ramus, the prosthetist should:
 - a. Lower the ischial seat slightly
 - b. Relieve the Scarpa's triangle area
 - c. Lower the medial wall 1/8" at a time
 - d. Relieve the lateral socket wall
12. Pronounced impact shock at full extension of the prosthetic knee indicates a need for:
 - a. a shorter stride.
 - b. external rotation of knee bolt.
 - c. more extension dampening controls.
 - d. less extension dampening controls.
13. During swing phase, a tendency for the AK prosthetic shin to make a marked inward movement of the knee accompanied by an outward movement of the foot is called:
 - a. Arching.
 - b. Medial whip.
 - c. Shin swing.
 - d. Lateral whip.
14. If the skeletal ML dimension of the IC socket is too large:
 - a. the ischial tuberosity protrudes over the posterior aspect of the socket.
 - b. the ischial moves posterior
 - c. the amputee complains of tightness over the trochanter.
 - d. the ischium drops into socket and the ramus hits the medial wall
15. Circumduction may be caused by:
 - a. loose extension dampening controls.
 - b. an uncomfortable medial brim.
 - c. TKA knee center that is too far posterior.
 - d. prosthesis that is too short.

16. The MTP measurement is taken from:
- the top of the knee to the floor with the amputee sitting.
 - the insertion of the quadriceps femoris to the floor with the amputee standing.
 - the medial - tibial plateau to the floor with the amputee sitting.
 - the ischial tuberosity to the floor with the amputee standing.
17. The reason for placing the AK socket in initial flexion is to:
- increase stride length.
 - place the prosthesis in a normal push-off position.
 - increase medio-lateral stability.
 - place the hip flexors in the optimum opponens position.
18. A possible amputee cause for Lateral Trunk Bending would be:
- the patient is afraid of stubbing his prosthetic foot during swing phase.
 - over firing of the hip abductors.
 - a very short residual limb.
 - the patient has a hip flexion contracture.
19. What muscle that is primarily an extensor of the knee becomes a major hip flexor in AK amputations?
- Sartorius
 - Rectus femoris
 - Vastus lateralis
 - Gracilis
20. Lateral trunk bending in the AK may be caused by:
- a prosthesis that is externally rotated.
 - painful distal lateral femur pressure.
 - a TKA Knee Center being too far anterior.
 - improper friction in the knee mechanism .
21. Short stride length on the prosthetic side would normally be caused by:
- a TKA too far anterior.
 - excessive pressure on pubic area.
 - excessive initial socket flexion.
 - insufficient socket flexion.
22. The starting height for Knee Center in the Transfemoral Prosthesis:
- Sound side MTP + 1"
 - Sound side MTP + 1/2"
 - Sound side MTP + 1/4"
 - Sound side MTP

23. Dr. Radcliffe advocates the use of a firm SACH heel cushion in the AK wearer, based upon his studies of biomechanics and kinematics.
- True
 - False
24. When the AK prosthetic foot is placed in excessive dorsiflexion:
- the knee is made more stable.
 - the amputee vaults when walking.
 - the knee is made unstable.
 - the ankle is made rigid.
25. If the AK amputee is having difficulty arising from a straight chair, he should be instructed to:
- place his prosthetic foot under the chair behind his sound foot.
 - place his sound foot under the chair behind his prosthetic foot.
 - lean back and lift himself out of the chair by his hands on the seat.
 - lean forward to bring his shoulders over his feet.
26. In order to walk efficiently and with good appearance, the amputee should be able to extend his prosthesis to an angle of 15 degrees back of the perpendicular at push-off. Which one of the following examples would meet this criterion?
- Anatomic hip extension is -5 degrees, initial socket flexion +5 deg.
 - Anatomic hip extension -10 degrees; initial socket flexion +5 deg.
 - Anatomic hip flexion +10 degrees; initial socket flexion +15 deg.
 - Anatomic flexion +15 degrees; initial socket flexion +15 deg.
27. The A - P measurement is the distance between the:
- Ischial seat and the end of the stump.
 - Ischial tuberosity and the trochanter.
 - Adductors and the extensors.
 - Adductor longus and the ischial tuberosity.
28. Voluntary knee control refers to:
- a knee axis that is posterior to the TKA line.
 - a knee axis that is anterior to the TKA line.
 - a knee axis on the TKA line.
 - a knee axis above the 4-bar linkage.
29. A Lateral whip is caused by:
- improper placement of the toe-break.
 - excessive external rotation of the ankle axis.
 - excessive internal rotation of the knee bolt.
 - excessive external rotation of the knee bolt.
30. Visual examination of the AK residuum will reveal:
- Bone spurs.
 - Neuroma.
 - Abrasion.
 - Trigger points.

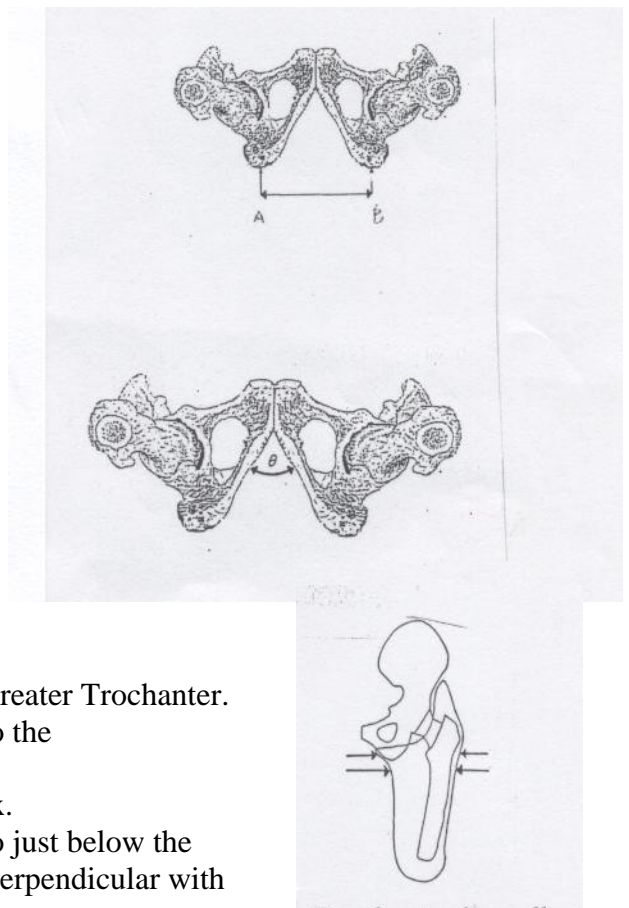
31. The toe lever in the prosthetic foot substitutes in part for the:
- Hamstrings.
 - Toe extensors.
 - Gastrocnemius.
 - Tibialis anterior.
32. The total distance the pelvis travels medio-laterally during locomotion is:
- 3".
 - 1 ½".
 - 2".
 - 2 ½".
33. In normal human locomotion, the pelvis rotates in the horizontal plane approximately:
- 10 degrees.
 - 16 degrees.
 - 8 degrees.
 - 5 degrees.
34. In normal human locomotion, the normal width of the walking base in adult males is:
- 1 inch.
 - 2 - 4 inches.
 - 4 - 6 inches.
 - ½ inch.
35. In TF wearers, what muscle group acts to decelerate the leg and stabilize the knee before heel strike?
- Pretibials
 - Hamstrings
 - Quadriceps
 - Adductors
36. What is the maximum amount of knee flexion observed during Swing Phase of Normal Human Locomotion?
- 15
 - 25
 - 45
 - 60
37. In the AK socket, the lateral wall is:
- made high for greater comfort in sitting.
 - shaped so that it is perpendicular to the ground.
 - adducted to stabilize the femur at midstance.
 - abducted to stabilize the femur at midstance.
38. When standing still, the amputee's ischial tuberosity in an AK socket is held in place on the seat chiefly by the:
- Medial wall.
 - Lateral wall.
 - Anterior wall.
 - Rectus Femoris channel.

39. Amputees with short AK residual limbs generally exhibit lateral bending of the trunk due to:
- powerful adductor muscles.
 - powerful abductor muscles.
 - loss of an adequate lever arm.
 - disequilibrium of flexors and extensors.
40. If AK suction suspension is inadequate, the first auxiliary suspension that should be tried is a:
- Rigid hip pelvic belt.
 - Shoulder harness.
 - Silesian bandage or TES Belt.
 - Flexible pelvic belt.
41. Vaulting on the sound foot by the AK Quadrilateral suction socket prosthesis wearer may be caused by:
- a prosthesis that is too long.
 - a prosthetic foot set in too much dorsiflexion.
 - a prosthesis that is too short.
 - the knee bolt being rotated too far medially.
42. The "T" (trochanter) landmark on the lateral wall of the AK socket is established by measuring one inch:
- laterally from the inner anterior-medial corner of the socket, then diagonally across to the brim of the lateral wall.
 - posteriorly from the outer anterior-medial transition of the socket.
 - 1" anterior from the ischial seat, then at right angles from the medial wall to the lateral wall transferred to the lateral brim.
 - 1" posteriorly from the anterior-medial corner of the socket, then at right angles to the medial wall to the lateral wall and up to the lateral brim.
43. The "T" Reference Line is:
- Coincides with the anatomic Trochanter
 - Is the starting position for a pelvic joint and band.
 - Represents an assumed weight line from patient to ground with patient standing.
 - The coronal reference mark for foot inset and outset.
44. Excessive heel rise at toe-off and into swing phase by the TF suction socket wearer may be caused by:
- weak hip flexors.
 - excessive hip extensor action.
 - knee friction set too tight.
 - knee friction set too loose.
45. You check the TKA line on an AK prosthesis with a yardstick and find the knee center is 1 1/2" posterior to that line. What is the result of this alignment?
- Knee instability in stance phase.
 - Knee instability at heel strike.
 - Excessive alignment stability.
 - Ease in "breaking" the knee at push-off.

46. While observing an AK amputee walking, you note that he vaults on his sound side. What prosthetic factor could cause this gait defect?
- Knee friction control too tight.
 - Prosthesis too long.
 - Toe lever arm too long.
 - Both 'a' and 'b'.
47. For the Trans Femoral amputee, the gluteus maximus works most efficiently when the:
- foot is flat on the floor.
 - hip is flexed 15 degrees or more.
 - knee is extended.
 - femur is internally rotated.
48. The origin of the hamstring muscle group is the:
- Ramus.
 - Pubes.
 - Ischium.
 - Trochanter.
49. Mediolateral stability of the pelvis is attained chiefly through the contraction of what muscle?
- Gluteus maximus
 - Rectus femoris
 - Gluteus medius
 - Adductor longus
50. Scarpa's triangle is bounded by the:
- Adductor longus, rectus femoris and inguinal ligament.
 - Adductor longus, ilio psoas and inguinal ligament.
 - Pectineus, sartorius and inguinal ligament.
 - Adductor longus, sartorius and inguinal ligament.
51. During swing phase in the AK prosthesis with a hydraulic swing control unit, resistance to _____ simulates the action of the Quadriceps muscle group in for the uninvolved person.
- knee flexion
 - knee extension
 - hip flexion
 - hip extension
52. In normal human locomotion, the most muscle energy expenditure occurs at:
- Acceleration.
 - Heel – strike.
 - Mid – stance.
 - Standing erect

53. Between AK heel contact and push off, Radcliffe describes the “zone of voluntary stability”, which allows considerable variation in the alignment of the prosthetic knee joint. The two major considerations in the alignment are:
- use of SACH feet and the shank being perpendicular to the floor at mid-stance.
 - use of single axis feet and stance control (braking) knee mechanism.
 - heel cushion firmness and height of the instant center of rotation.
 - knee stability at heel contact and ease of flexion during push-off.
54. In the Ischial Containment socket, skeletal contact is achieved over the _____ areas to achieve M-L stability.
- proximal medial and most distal lateral
 - proximal lateral and most distal medial
 - gluteus maximus and rectus femoris
 - adductor longus and sartorius
55. The anterior - medial quadrant of an Ischial Containment shaped socket is contoured to provide depression of the femoral triangle. All of the following are reasons this depression is in place except:
- relief of adductor longus.
 - provide rotational control.
 - insures proper donning.
 - provides area for weight bearing in early stance.
56. An Ischial Containment shape that is too tight in the anterior lateral quadrant could result in:
- a swing phase whip.
 - possible loss of ischial containment.
 - improved suspension.
 - stance phase knee instability.
 - Both ‘a’ and ‘b’.
57. The height of the lateral wall proximal to the trochanter is important for:
- biomechanical support.
 - cosmetic appearance.
 - increased axial support.
 - knee stability.
58. One biomechanical reason that flexion is placed into an Ischial Containment prosthesis is:
- to put the hip flexors on stretch.
 - to achieve normal position at toe off.
 - to put hip adductors on stretch.
 - to lengthen the prosthetic stride.
59. It is critical that the Trans Femoral amputee keeps the prosthetic knee joint extended throughout stance phase by the action of the knee unit’s inherent stability and the amputee’s voluntary control over it. The knee unit characterized by the least inherent stability and requiring the most voluntary control is the:
- Manual Locking knee.
 - Polycentric 4-Bar knee.
 - Constant Friction (Single Axis) knee.
 - Weight Activated (Stance Control) knee.

60. Two distinct advantages to the Knee Disarticulation amputation as compared to the Transfemoral type are:
- it is best suited for Quadrilateral socket shape and it is best for suction suspension.
 - distal weight bearing allows direct load transfer and maintains femoral length in growing children.
 - it is best for Ischial weight bearing and it maintains the best angle of adduction for vertical loading.
 - it is the easiest to don and doff when the condyles remain and it is best for proper knee center height.
61. Which of the following are advantages to the Knee Disarticulation amputation for prosthetic fitting?
- Cosmesis of prosthesis
 - Bulbous condyles may allow non-suction suspension through a removable plate
 - Proximal weight bearing
 - Low knee center
62. The two most common knee mechanisms used in the Knee Disarticulation prosthesis to simulate the anatomic knee center are:
- Locking and Hydraulic.
 - Polycentric and Outside Hinges.
 - Stance Phase Control and Hydraulic.
 - Single Axis and Locking.
63. The terminology used to describe the distance between points A & B is:
- the Binomial factor.
 - the Trochanteric compression test.
 - Bi - ischial diameter.
 - Ramus angle.
64. What is angle Ø called?
- Ramus arch.
 - Pubic arch angle.
 - Diametric Pentameter.
 - Bi-ischial Ramus angle.
65. In most individuals the angle Ø will be:
- greater in females than males.
 - angled downward and inward.
 - oblique to the line of progression.
 - smaller in females than males
66. The skeletal M-L is measured:
- Under the ischium to the apex of the greater Trochanter.
 - Diagonally from the adductor group to the Gluteus Medius muscle group.
 - On the Femoral Condyles at their apex.
 - From the medial side of the ischium to just below the greater Trochanter laterally and on a perpendicular with the ramus angle.



67. The term "Ischial Containment" means:
- containing the ischial tuberosity laterally, inferiorly, and anteriorly.
 - containing the ischial tuberosity from the lateral side only.
 - containing the ischium from the medial, posterior, and inferior sides.
 - containing the ischium from the medial side only.
68. The "True" Silesian Bandage has _____ anterior attachment points.
- one
 - two
 - three
 - total contact; through neoprene sleeve
69. The Silesian Bandage has been found a valuable aid in stabilizing the AK prosthesis against rotation and lateral instability in cases of short or excessively flabby residual limbs.
- True
 - False
70. If the Silesian Bandage does not correct a whip, you conclude that the problem is:
- amputee caused, e.g. flabby, short residuum, weak musculature.
 - prosthetic caused, e.g. knee bolt rotation, large P.M. wall angle.
 - prosthetist caused, e.g. socket flexion, narrow M.L. wall angle.
 - none of the above.
71. The starting point for location of the Rigid Pelvic Joint to the socket is:
- 1 ½ inches proximal to the ischial seat level.
 - ½ inch anterior and 1 inch superior to the trochanter mark.
 - ½ inch posterior and 1 inch inferior to the trochanter mark.
 - 1 ½ inches distal to the ischial seat level.
72. What is a disadvantage of the TES Belt?
- Total contact provides more positive suspension.
 - Neoprene material is more comfortable when sitting.
 - Tends to be more difficult for arthritis sufferers to don and doff.
 - It is compatible with partial suction applications.
73. The Mauch Swing-N-Stance cylinder offers a hybrid of knee mechanisms. They are:
- Hydraulic and Constant Friction.
 - Hydraulic and Stance Control.
 - Hydraulic, Stance Control, and Manual Locking.
 - Hydraulic, Stance Control, and Polycentric.
74. All present hydraulic swing control devices aim to provide friction from valve orifices or rough channels increasing approximately as the _____ of the cadence, so there is very little resistance at slow motion, moderate resistance at normal speed comparable to a well adjusted mechanical friction device, yet extremely high resistance to fast motion at high speed.
- direct function
 - square
 - cube
 - indirect function

75. The Total Knee with Hydraulic Swing Phase Control will be paid for by Medicare if the patient has what Functional Level?
- K0
 - K1
 - K2
 - K3
76. How is socket flexion determined from the ICAK plaster/master model?
- Socket flexion is always set at a positive 10 degrees.
 - Socket flexion is determined by holding the pelvis level then bringing the legs together, leaving about a hand width of space for socket thickness. The measurement is taken on the lateral side of the residual limb.
 - Socket flexion is determined by first holding the pelvis level to the floor, flex the residual limb forward then backward until the pelvis rotates. Add 5 degrees to this measurement.
 - Socket flexion is determined by leveling the medial wall with respect to the floor. The socket will be in the proper flexion attitude when the medial wall is level.
77. In normal use, the pressure within the Trans Femoral suction socket is:
- negative during Swing Phase and positive during Stance Phase.
 - negative at all times.
 - positive at all times.
 - positive during Swing Phase and negative during stance phase.
78. The Knee Classification with the least 'Inherent Stability' is the:
- Manual locking knee.
 - Total Knee.
 - Single Axis.
 - 4-Bar linkage.
 - Stance Control.
79. Circumduction may be caused by:
- less extension dampening controls.
 - an uncomfortable medial brim.
 - a TKA knee center that is too far posterior.
 - a prosthesis that is too short.
80. Referring to Knee Stability, what would be the effect of raising the Vertical Height of the instant Center of Rotation?
- Reduces the hip moment required to maintain prosthetic knee stability
 - Increases the hip moment required to maintain prosthetic knee stability
 - Increases the hip moment required to initiate prosthetic knee flexion
 - Does not affect the hip moments required to break the knee.
81. During Loading Response in Normal Human Locomotion, the ground reaction force is:
- Anterior to the knee
 - Posterior to the knee
 - Posterior to the hip
 - Goes right through the anatomical knee axis

82. During Terminal Stance (Heel Off) in Normal Human Locomotion, the ground reaction force is:
- Anterior to the knee
 - Posterior to the knee
 - Anterior to the hip
 - Goes right through the anatomical knee axis
83. The Trans Femoral patient displays an abducted gait at midstance when ambulating with her prosthesis. Which of the following is the best cause for this deviation?
- The weight line is posterior to the knee center.
 - The patient is experiencing excessive ramus pressure.
 - The prosthesis is too short.
 - The heel cushion is too soft.

SHORT ANSWER:

- (2 points) If the transfemoral amputee has a very long residual limb with strong hip extensors, and no hip flexion contracture, where would you expect to align the TKA for a single axis knee? What is the term used to describe this type of control?
- (4 points) A young woman (27 years) with an 8" transfemoral amputation is having difficulty achieving equal step length during dynamic alignment! She has a long stride on the prosthetic side and at times her prosthetic knee buckles at heel contact. She exhibits excess lumbar lordosis, and her hip has been measured with a 5 degree flexion contracture. She checked out perfectly at delivery two weeks ago. She has a 3/8" heel height on her prosthetic foot. Name two possible causes for her problems:
 -
 -
- (5 points) A 47 year old man with a traumatic AK amputation is seen to exhibit head sway over his prosthesis of 4-5" viewed at midstance.
 - What is the proper name for this gait deviation?
 - Name two prosthetic causes of this deviation:
 - Name two amputee causes of this deviation:

4. (4 points) A 64 year old banker is presented in clinic. He is a bilateral AK amputee, and is using a wheelchair. He has severe heart problems, having had two heart attacks in the past 3 years. He weighs 150 lbs., his left AK is 6" with 20 degree flexion contracture and his right AK is 8" with a 25 degree flexion contracture. What is your recommendation for this patient?

5. (6 points) What are the three biomechanical principles and their respective functions that are utilized to stabilize the AK Prosthesis in the Medio-Lateral plane?
 1. Function

 2. Function

 3. Function

6. (5 Points) Name the 5 classifications of prosthetic knee mechanisms and one advantage and disadvantage of each.

| | <u>Advantage</u> | <u>Disadvantage</u> |
|----|------------------|---------------------|
| a. | | |
| b. | | |
| c. | | |
| d. | | |
| e. | | |

7. (5 Points) What are the 5 most probable causes for gapping between the residual limb and the ICAK Socket at the proximal lateral brim?
 - a.
 - b.
 - c.
 - d.
 - e.

8. (5 points) A 72 year old female AK, weighs 172 lbs. has lost her leg due to peripheral vascular disease. She is a smoker and an alcoholic. The amputation is just above the femoral condyles. She plays Bingo in Leisure World, but lives in Northridge some 90 miles away. But she does drive a compact – a Mini Cooper! This patient is very non compliant; she only shows up when components are falling apart. What is your prosthetic recommendation and why?

Socket/Interface

Suspension

Knee


Foot

Alignment

9. (4 points) John is a 25 year old bilateral AK secondary to high tension electrical burns he received while trimming his palm tree. He has considerable distal scarring on his 10” residual limbs. He has a positive attitude toward rehabilitation, but the insurance company informs you they are not anxious to fund expensive limbs unless you can provide evidence that he use them successfully. What prosthetic recommendation can you give so that your patient, his insurance company do not waste time, effort, and money?

APPENDIX V.

Perceived Teaching Effectiveness Forms


 To Reorder 1-800-722-6876 FORM NO. F-8659-CSDH M8-2895-E1535-12 11 10 9 8 7 Printed in U.S.A.

CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS
SPECIAL SESSIONS

PERCEIVED TEACHING EFFECTIVENESS



| DEPT. | COURSE | SECTION | LAB | UNITS |
|-----------------------------|--------|---------|-----|-------|
| HEA | 342 | 71 | | |
| INSTRUCTOR | | | | |
| G. HAM-ROSEBROCK | | | | |
| SEMESTER AND YEAR PART TIME | | | | |
| SUMMER 2006 | | | | |

1 2 4 8 16 2 4 7 P
 1 2 4 8 16 1 2 4 7 P
 1 2 4 8 16 1 2 4 7 P

1 2 4 8 16 2 4 7 P
 1 2 4 8 16 1 2 4 7 P
 1 2 4 8 16 1 2 4 7 P

INSTRUCTIONS:
 You are asked to judge the teaching effectiveness of the instructor of this course. Please bear in mind that major consideration is given to student evaluation in the instructor's continued retention and promotion in this college. We would therefore appreciate careful evaluation in rating effectiveness by marking the appropriate number on the one-to-five point scale.

- Use only a No. 2 pencil.
- The answer you select in the columns to the right must be marked neatly and clearly.
- Only one response per question is allowed.
- To change a response please erase completely.

Improper Mark 
 Proper Mark 

LEGEND: 1 - STRONGLY AGREE 2 - AGREE 3 - NEUTRAL 4 - DISAGREE 5 - STRONGLY DISAGREE NA - DOES NOT APPLY

WRITTEN COMMENTS

15. What has the instructor done especially well in the teaching of this course?

Please continue on back of sheet with this end up.

**DO
NOT
MARK
IN
THIS
AREA**

7. THE ASSIGNMENTS WERE HELPFUL IN
COURSE NUMBER HEA342 71, COMPLETED SUMMER 2006 TO BE INCLUDED AUTOMATICALLY
IN RTP FILE

G HAM-ROSEBROCK PART TIME
TEAM TAUGHT WITH K MULLER

LOWER LIMB ORTHOTICS II

NUMBER OF STUDENTS ENROLLED END OF 3RD WEEK
NUMBER OF FORMS MACHINE-ACCEPTED

| | NUMBER | PERCENT | |
|--|--------|---------|-------------------|
| 1. THE INSTRUCTOR HAS COMMAND OF THE SUBJECT. | 0 | 0 | STRONGLY AGREE |
| | 3 | 50 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 1 | 17 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 2. THE INSTRUCTOR EXPRESSED HIMSELF/HERSELF CLEARLY. | 1 | 17 | STRONGLY AGREE |
| | 1 | 17 | AGREE |
| | 1 | 17 | NEUTRAL |
| | 1 | 17 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 3. THE INSTRUCTOR EXHIBITED A SERIOUS DESIRE TO TEACH STUDENTS | 1 | 17 | STRONGLY AGREE |
| | 2 | 33 | AGREE |
| | 1 | 17 | NEUTRAL |
| | 2 | 33 | DISAGREE |
| | 0 | 0 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 4. THE INSTRUCTOR SHOWED ENTHUSIASM FOR THE SUBJECT. | 0 | 0 | STRONGLY AGREE |
| | 4 | 67 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 2 | 33 | DISAGREE |
| | 0 | 0 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 5. THE INSTRUCTOR STATED CLEARLY WHAT WAS EXPECTED OF STUDENTS. | 2 | 33 | STRONGLY AGREE |
| | 1 | 17 | AGREE |
| | 1 | 17 | NEUTRAL |
| | 0 | 0 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 6. THE COURSE CONTENT COVERED THE STATED PURPOSES OF THE COURSE. | 0 | 0 | STRONGLY AGREE |
| | 4 | 67 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 0 | 0 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |

| | | | |
|---|---|----|-------------------|
| 7. THE ASSIGNMENTS WERE HELPFUL IN LEARNING THE SUBJECT MATTER. | 0 | 0 | STRONGLY AGREE |
| | 3 | 50 | AGREE |
| | 1 | 17 | NEUTRAL |
| | 0 | 0 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 8. THE TESTS GIVEN WERE RELATED TO COURSE CONTENT. | 1 | 17 | STRONGLY AGREE |
| | 2 | 33 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 3 | 50 | DISAGREE |
| | 0 | 0 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 9. THE INSTRUCTOR WAS RESPONSIVE TO STUDENTS' QUESTIONS. | 0 | 0 | STRONGLY AGREE |
| | 3 | 50 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 1 | 17 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 10. THE INSTRUCTOR ALLOWED APPROPRIATE STUDENT PARTICIPATION AND DISCUSSION. | 0 | 0 | STRONGLY AGREE |
| | 3 | 50 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 1 | 17 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |
| 11. THE INSTRUCTOR WAS WILLING TO ARRANGE FOR A MUTUALLY CONVENIENT MEETING TIME, WHEN REQUESTED. | 0 | 0 | STRONGLY AGREE |
| | 2 | 33 | AGREE |
| | 1 | 17 | NEUTRAL |
| | 0 | 0 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 1 | 17 | NA-DOES NOT APPLY |
| 12. THE INSTRUCTOR IN THIS COURSE WAS AN EFFECTIVE TEACHER. | 0 | 0 | STRONGLY AGREE |
| | 4 | 67 | AGREE |
| | 0 | 0 | NEUTRAL |
| | 0 | 0 | DISAGREE |
| | 2 | 33 | STRONGLY DISAGREE |
| | 0 | 0 | NA-DOES NOT APPLY |

APPENDIX VI.

CSUDH ORTHOTIC CERTIFICATE GRADUATE QUESTIONNAIRE

Month & Year completed CSUDH course work: _____ Today's date: _____

Please rate the statements according to the following scale:

5=strongly agree 4=agree 3=neutral 2=disagree 1=strongly disagree NA=not applicable to my practice

The following courses and content areas were adequately covered for me to function as an **entry level resident**.

| | | | | | | |
|--|---|---|---|---|---|-----|
| 1. Upper Limb Orthotics, as a complete course: | 5 | 4 | 3 | 2 | 1 | N/A |
| Specific topics: | | | | | | |
| - Metal systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Plastic devices | 5 | 4 | 3 | 2 | 1 | N/A |
| - Fracture Management | 5 | 4 | 3 | 2 | 1 | N/A |
| - Mobile Arm Supports | 5 | 4 | 3 | 2 | 1 | N/A |
| - Off-the-Shelf devices | 5 | 4 | 3 | 2 | 1 | N/A |
| 2. Spinal Orthotics, as a complete course: | 5 | 4 | 3 | 2 | 1 | N/A |
| Specific topics: | | | | | | |
| - Metal systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Post-op TLSO/LSO systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Cervical orthoses | 5 | 4 | 3 | 2 | 1 | N/A |
| - Scoliosis | 5 | 4 | 3 | 2 | 1 | N/A |
| - Cranial Remolding Helmets | 5 | 4 | 3 | 2 | 1 | N/A |
| - HALO systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Off-the-Shelf devices | 5 | 4 | 3 | 2 | 1 | N/A |
| 3. Lower Limb Orthotics, as a complete course: | 5 | 4 | 3 | 2 | 1 | N/A |
| Specific topics: | | | | | | |
| - Foot Orthoses | 5 | 4 | 3 | 2 | 1 | N/A |
| - UCBLs | 5 | 4 | 3 | 2 | 1 | N/A |
| - Metal AFO systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Plastic AFO systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Off-the-Shelf devices | 5 | 4 | 3 | 2 | 1 | N/A |
| - Metal KAFO systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - Plastic/Hybrid systems | 5 | 4 | 3 | 2 | 1 | N/A |
| - HKAFOs and RGOs | 5 | 4 | 3 | 2 | 1 | N/A |
| - Componentry | 5 | 4 | 3 | 2 | 1 | N/A |

FORMAL INSTRUCTION

| | | | | | | |
|---|---|---|---|---|---|-----|
| 4. Materials Science | 5 | 4 | 3 | 2 | 1 | N/A |
| 5. Anatomy and Physiology | 5 | 4 | 3 | 2 | 1 | N/A |
| 6. Biomechanics and Kinesiology | 5 | 4 | 3 | 2 | 1 | N/A |
| 7. Normal and pathological gait | 5 | 4 | 3 | 2 | 1 | N/A |
| 8. Research methods | 5 | 4 | 3 | 2 | 1 | N/A |
| 9. Disease entities, etiology & treatment | 5 | 4 | 3 | 2 | 1 | N/A |
| 10. Diagnostic imaging | 5 | 4 | 3 | 2 | 1 | N/A |

CONTENT AREAS

| | | | | | | |
|---|---|---|---|---|---|-----|
| 11. Billing and reimbursement | 5 | 4 | 3 | 2 | 1 | N/A |
| 12. Documentation | 5 | 4 | 3 | 2 | 1 | N/A |
| 13. Rehabilitation team practices | 5 | 4 | 3 | 2 | 1 | N/A |
| 14. Patient assessment (ROM, MMT, etc) | 5 | 4 | 3 | 2 | 1 | N/A |
| 15. Patient management and education | 5 | 4 | 3 | 2 | 1 | N/A |
| 16. Legal and ethical practices | 5 | 4 | 3 | 2 | 1 | N/A |
| 17. Interaction with other health professionals | 5 | 4 | 3 | 2 | 1 | N/A |

CSUDH GRADUATE QUESTIONNAIRE

1. Please comment below on any survey responses from the previous page of '2 = Disagree' or '1 = Strongly Disagree':
2. If you could make three changes to improve the quality of the CSUDH Orthotic Program, they would be:
3. In which specific areas of Orthotics were you least prepared?
4. Which content areas or topics need more time or attention in our curriculum? Was there a topic which could be removed from the curriculum?
5. Do you feel you were allowed enough time with the patient/student models in each section to maximize your learning? If not, please elaborate.
6. Do you feel the tests, quizzes, practicals and critiques were adequate in content and frequency?

APPENDIX VII.

Summary of Group Focus Meeting (Orthotic Certificate)

Notes from the ‘Town Hall Meetings’ held with the Orthotic students as they completed each module of the Spring 2006 Semester

Upper Extremity Orthotics

- One student requested that one an additional plastic WHO project be added to the schedule. The suggestion was to remove a metal Orthotic project & replace it with an additional plastic device.
- Another student suggested more emphasis on casting of upper limb Orthotics.
- A few students agreed that the presentation of 9 major upper extremity pathologies in 1 day was over whelming. The suggestion was to break-up and therefore distribute the pathology presentations throughout upper limb Orthotics.
- Another student wanted to know what else was available for upper limb Orthotic devices from the off-the-shelf (OTS) arena and had wished we had spent more time covering OTS items.
- In regards to the guest lecturer, overall the class enjoyed the material and the information. However they felt the presenter was inexperienced and a bit “dry”.

Spinal I Orthotics

- The students enjoyed the one day session of trying on and practice fitting of 2 different OTS spinal systems.
- In general, the students felt Spinal I was more organized and more interesting than Upper Extremity.
- They felt that this module will be more applicable to their real world experiences.
- In regards to the assigned projects:
 - they requested more specific guidance for the modification process for bivalved, Kydex TLSO.
 - also, they felt that the Kydex project needs to be made with a full foam liner.

Spinal II Orthotics

- The 2 day Boston Brace Course was excellent and the students really enjoyed and appreciated fabricating scoliosis jackets for each other.
- There was a lot of frustration expressed with the Milwaukee fabrication project.
 - Students stated there wasn’t good leadership in the laboratory for the fabrication process.
 - They were frustrated that the instructor leading this project did not complete the instructor’s project. This was unacceptable to all the students.
 - In addition, the students mentioned that there were 2 days in which the instructor leading this project was late and that the students had to wait for him to do anything.

Lower Limb Orthotics I & II

- Again, the students felt this was a better module than Upper Extremity Orthotics because it will be more applicable to their real world experiences.
- The students especially enjoyed working with real patients rather than evaluating and fabricating devices for each other.
- There were some concerns mentioned regarding the fabrication of projects:
 - Regarding the Axial Resist AFO: 1) there needs to be more time spent on this project...it was too rushed; 2) Within the fabrication manual, there weren't enough photos describing the steps of fabrication; 3) Finally, there wasn't a completed instructors sample for the students to refer to during the project.
- The student's also suggested bringing in additional practitioners during the fabrication of Lower Extremity Orthotics:
 - Since this module will be the majority of what they will see in the real world, they wanted more perspectives
 - Also, there was frustration because the fabrication instructor would deviate from the fabrication manuals without a thorough explanation as to why something different was done.
- There were some scheduling conflicts that were frustrating for the students:
 - Not having all the materials available at the beginning of a project.
 - Not starting on time in the morning as per the schedule.
 - Some daily sections were too rushed while others ended early and there wasn't anything else scheduled or planned.

APPENDIX VIII. **CSUDH PATIENT SURVEY** **(Confidential: Only Used for Program Feedback to Student)**

Please provide comments on your student practitioner's performance on various activities in the fitting of your artificial limb or brace. This information will be used to help your student improve their skills.

Student Practitioner: _____ Today's date: _____

Please rate the statements according to the following scale:

5=Excellent 4=Good 3=Average 2=Below Average 1=Did not complete NA=not applicable

The following skills and tasks were adequately completed by my student as part of this fitting:

1. Introduction/Explanation

| | | | | | | |
|---------------------------------------|---|---|---|---|---|-----|
| - Introduced themselves | 5 | 4 | 3 | 2 | 1 | N/A |
| - Stated the purpose of today's visit | 5 | 4 | 3 | 2 | 1 | N/A |
| - Kindness/courtesy | 5 | 4 | 3 | 2 | 1 | N/A |

2. Evaluation & Measurements

| | | | | | | |
|-------------------------------------|---|---|---|---|---|-----|
| - Listened to you | 5 | 4 | 3 | 2 | 1 | N/A |
| - Asked about your daily activities | 5 | 4 | 3 | 2 | 1 | N/A |
| - Asked you to bend your limbs | 5 | 4 | 3 | 2 | 1 | N/A |
| - Made appropriate measurements | 5 | 4 | 3 | 2 | 1 | N/A |
| - Tested your strength | 5 | 4 | 3 | 2 | 1 | N/A |

3. Casting:

| | | | | | | |
|------------------------------------|---|---|---|---|---|-----|
| - Explained the procedure | 5 | 4 | 3 | 2 | 1 | N/A |
| - Used a sock or nylon | 5 | 4 | 3 | 2 | 1 | N/A |
| - Kept your limb free of ink marks | 5 | 4 | 3 | 2 | 1 | N/A |
| - Removed cast without pain | 5 | 4 | 3 | 2 | 1 | N/A |
| - Cleaned your limb after casting | 5 | 4 | 3 | 2 | 1 | N/A |

4. Fitting:

| | | | | | | |
|------------------------------------|---|---|---|---|---|-----|
| - Fit the device gently | 5 | 4 | 3 | 2 | 1 | N/A |
| - Fit with correct number of socks | 5 | 4 | 3 | 2 | 1 | N/A |
| - Fit was comfortable & pain free | 5 | 4 | 3 | 2 | 1 | N/A |
| - Adequate suspension | 5 | 4 | 3 | 2 | 1 | N/A |

5. Alignment:

| | | | | | | |
|---|---|---|---|---|---|-----|
| - Walked safely between parallel bars | 5 | 4 | 3 | 2 | 1 | N/A |
| - Adjustments were effective | 5 | 4 | 3 | 2 | 1 | N/A |
| - Adjustments made me walk better | 5 | 4 | 3 | 2 | 1 | N/A |
| - Took care of my concerns | 5 | 4 | 3 | 2 | 1 | N/A |
| - Explained when to return for Critique | 5 | 4 | 3 | 2 | 1 | N/A |

If you could make two changes to improve the quality of your student's performance, they would be:

Behavior: _____

Skills: _____

APPENDIX IX.



Commission on Accreditation OF ALLIED HEALTH EDUCATION PROGRAMS

The Commission on Accreditation of Allied Health Education Programs
certifies that the

Orthotics Program- Certificate

California State University
Carson State University

has completed an accreditation review and is judged to be
in compliance with the nationally established standards
this 17th day of November 2006 and expiring the 30th day of November 2009.

A handwritten signature in dark ink, appearing to read "Gregory P. Paulowski".

President, Board of Directors

A handwritten signature in dark ink, appearing to be a stylized "B" followed by a flourish.

Chair, Committee on Accreditation



Commission on Accreditation

OF ALLIED HEALTH EDUCATION PROGRAMS

The Commission on Accreditation of Allied Health Education Programs
certifies that the

Prosthetics Program

California State University
Carson, California

has completed an accreditation review and is judged to be
in compliance with the nationally established standards
this 20th day of May 2005.

A handwritten signature in dark ink, appearing to read 'Gregory P. Paulauskas', written over a horizontal line.

President, Board of Directors

A handwritten signature in dark ink, appearing to read 'By: M. J.', written over a horizontal line.

Chair, Committee on Accreditation